THE IRON AGE

Contents

MARCH 30, 1939

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MARCH 30, 1939

ESTABLISHED 1855 Vol. 143, No. 13

No Whitewash!

A READER writes with reference to improved machines and employment: "Are you trying to whitewash the machine? You know as well as I do that it displaces labor. You know that when a machinery salesman tries to sell a prospect, he points out the labor-saving that will be effected. If that isn't adding to unemployment, I would like to know what you call it?"

Now that question should be answered, and shall be.

First, we are not interested in giving the machine a coat of whitewash. It wouldn't last long, if we did, and too many people would see through it. As a matter of fact what we are trying to do is just the opposite. We want to wipe off the dust that coats the machine and prevents people from seeing it as it actually is.

If people could see the machine as it is—not as it is reported to be by its enemies or its friends—they would see that, like any other great natural or economic force, it has destructive as well as constructive effects.

People drown because of the existence of water, but we do not outlaw water because of that. Fire destroys houses and industrial plants, but it is vitally necessary to have it available to both.

Machines do displace men from jobs to which they have been accustomed. And machines do create new jobs that would not have existed otherwise.

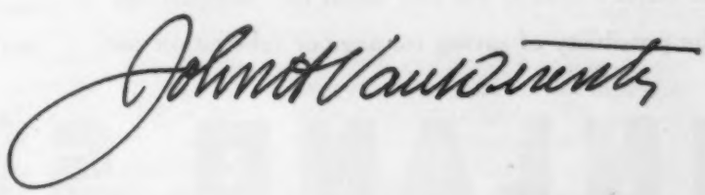
Machines will always and have always displaced labor. That is what they are for. Oftentimes this displacement is in the form of promotion to a better job.

After the invention of the wheeled cart, one man with the aid of a team of horses could transport more material further in an hour than could 100 slaves hitched to a skid sled.

Against this displacement, think over the fact that no great industry could exist today and no useful product be broadly made and distributed had it not been for the progressive introduction of so-called "labor-saving" machinery.

We need a sense of proportion in weighing the results. The displacement effect of improved machinery has been vastly exaggerated. How many men or women do you know, among the thousands in your industry, that have been actually deprived of employment during 1938 because of the introduction of machinery? I venture to say that the total number thus affected is not anywhere near the number killed by automobiles during the same period.

Society has a duty in accident prevention. And industry has a duty to ameliorate the effects of technical displacement. But we cannot outlaw technological advances any more than we can outlaw water or the automobile.



Saving Weight and Fabrication Costs

The many uses of structural steel in equipment as well as in building construction offer numerous opportunities for the services of the Inland engineer to prove of real value.

Weight often can be reduced without sacrifice of structural strength. Ease of handling and appeal to the buyer's critical eye can often be "stepped up."

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WHAT ABOUT *Grain Size?*

CARL L. SHAPIRO
Consulting Engineer, New York

THIS is the second section of a three-part article, and deals with the factors which influence the austenitic grain size. Part I, describing the various methods by which the austenitic grain size is determined, appeared in the March 16, 1939, issue of THE IRON AGE. Part III, describing the effect of the austenitic grain size upon the mechanical and physical properties of steel, will appear within the near future.

SINCE the discussion in the first section of this article described solely the various methods by which the austenitic grain size in steel may be determined, the factors influencing the final austenitic grain size will now be discussed in a general manner, inasmuch as the results today are not sufficient to warrant definite conclusions.

Prior Structure (Heat Treatment): The influence of prior heat treatment (which determines the structural condition of the material) upon the austenitic grain size has been lately receiving much attention. In the A. S. M. Grain Size Symposium, Grossmann[7] showed that when certain steels were given a prior heat treatment their coarsening temperature varied. (Coarsening range is the nomenclature applied to the temperature or ranges of temperatures at which the austenitic grain size begins to show excessive grain growth or coarsening.) He also noted in some steels that the air cooled (normalized) specimens coarsened more readily than the furnace cooled, oil or water hardened steels; whereas, in others, this trend did not follow. He explained this phenomenon by the assumption that the prior structure (heat treatment) affected the degree of dispersion of the grain growth inhibitors in the steel, which in turn is superimposed upon the initial grain size and, consequently, these factors combine to influence the coarsening range. This conclusion was later verified by other investigators.

To observe the effect of prior structure upon one per cent basic electric carbon tool steels, Schempp and Shapiro[8] carburized (8 hr. at 1700 deg. F) a series of heat treated specimens ranging from a completely spheroidized to a martensitic condition (hardening and tempering) and from a coarse pearlite to a fine pearlitic structure by varying the cooling rates. The results obtained showed that in some steels the structural condition, prior to the McQuaid-Ehn test or any other method used to determine grain size, influences the final austenitic grain size rating and that a fine grained aggregate of ferrite and cementite will yield a small austenitic grain size; whereas a coarse grain aggregate will yield a coarse austenitic grain. However, in other steels of the same chemical composition, the results were markedly different. In some cases, the austenitic grain size was identical, regardless of prior structure; in others, the fine grained prior structure yielded a coarse austenitic grain and vice versa, a coarse grained prior structure yielded a fine austenitic grain size. Investigating the cause of these marked differences, it was found that the deoxidation process varied slightly in certain heats and, natural-

[7] M. A. Grossmann, Transactions A. S. M., Vol. XXII, 1934, p. 861.
[8] B. H. McCarthy, THE IRON AGE, Oct. 10 and 17, 1935.

ly, influenced the effect of the prior structure upon the austenitic grain size, as will be shown later.

The effect of prior structure upon the austenitic grain size of eutectoid steel was also studied by Tobin and Kenyon[9]. Their findings upon hot rolled eutectoid steel were that the final austenitic grain size was the same whether the steel had a coarse or fine-grained prior structure. From the investigations mentioned, which are also supplemented by other investigators, it appears certain that the effect of prior structure upon the austenitic grain size cannot be predicted unless a knowledge of the melting and deoxidation methods is had since they determine the final grain growth behavior, especially after prior heat treatment.

Mechanical Deformation: Mechanical deformation may be divided into two classes, hot and cold work. The difference between these two is that the former—hot work—implies that recrystallization has already occurred during working since the temperature of mechanical deformation is above the recrystallization temperature; whereas, in the latter, mechanical deformation occurs below the temperature of recrystallization and the material is in a distorted condition capable of grain growth or grain refinement, depending upon the time and temperature of recrystallization. (The temperature of recrystallization is a function of the degree of cold work.) Therefore, these two factors, hot and cold work, are studied separately.

Hot Work: Grossmann[7] showed in hypo-eutectoid steels that hot work may result either in a finer or coarser grained McQuaid-Ehn grain size, depending upon the finishing temperature. If the finishing temperature is below the coarsening range, the resultant grain size is smaller; if above the coarsening range, the grain size is larger. However, it should be borne in mind that the coarsening range is variable and that increasing percentages of mechanical deformation automatically lower the coarsening range. This is shown by Grossmann in Fig. 4.

Schempp and Shapiro[4] also showed the effect of variation in reduction at a constant temperature by heating bars at 2000 deg. F. and forging them quickly to a point. Their results substantiate Grossmann's findings that the coarsening temperature is lowered with the degree of hot work. They also investigated the effect of temperature (constant reduction) upon the austenitic grain size and found that the depth of carburization and grain size increased progressively with forging temperature.

Cold Work: The effect of cold mechanical deformation upon the austenitic grain size, as determined by the McQuaid-Ehn carburizing test, was effectively revealed by McCarthy[8] and Schempp and Shapiro[4]. They found in all steels examined that (1) the coarsening range is progressively lowered with the amount of reduction; (2) grain refinement occurred below the coarsening range as in the hot worked steels; and (3), as soon as the coarsening range is reached, grain growth becomes a function of the degree of deformation (constant time and temperature).

In order to determine whether the effect of grain size variation after cold work was caused by (a) recrystallization below the thermal critical range, (b) slow heating to the austenitic temperature (1700 deg. F.) or (c) by carburization, a series of U bent bars (1 in. diameter) similar to the one shown in Fig 5 were heated by the author to 1100 deg., 1150 deg. and 1200 deg. F. from 2 to 24 hr. and air cooled. These cooled and heat treated bars were carburized 8 hr. at 1700 deg. F. with a series of unheated bent bars and examined microscopically.

The results obtained, after the application of the McQuaid-Ehn test, showed that the carburized cold

AT RIGHT

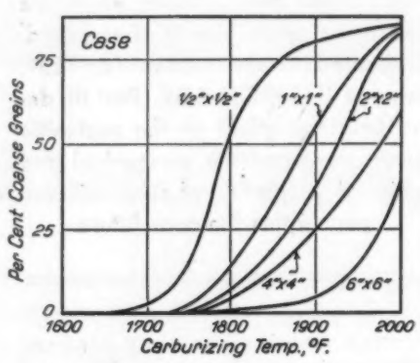
Fig. 5

THE effect of cold work upon the austenitic grain size, as determined by the McQuaid-Ehn carburizing test. At 100 diameters.

BELOW

FIG. 4

STEEL No. 3 (Table I); showing the results of prior hot working on the case. (Grossmann.)



[9] C. H. Herty, D. L. McBride and S. O. Hough, Cooperative Bulletin 65, Metallurgical Advisory Board to Carnegie Institute of Technology.

[10] C. H. Herty, D. L. McBride, and Hollenback, Transactions A. S. M., Vol. XXV, 1937, p. 297.

[11] J. E. Dorn and O. E. Harder, Transactions A. S. M., Vol. XXVI, 1938, p. 106.

TABLE I

The Effect of the Degree of Cold Drawing on the Austenitic Grain Size

Diameter, In Inches	Reduction Per Cent	Austenitic Grain Size			
		A	B	C	D
Billet	...	8+	8+	8+	6/7
0.303	...	8	8	8	5/6
0.270	0.20	7/8	7/8	6/8	4/6
0.223	0.46	7/8	7/8	6/8	4/6
0.203	0.55	7/8	7/8	6/8	4/6
0.180	0.65	7/8	7/8	6/8	4/6
0.160	0.72	7/8	7/8	6/8	4/6

worked specimens which were reheated below the thermal critical range invariably possessed a coarser austenitic grain size than those which were not reheated below the critical range. These findings definitely indicate that (a) grain growth occurred prior to carburizing and that the McQuaid-Ehn test only outlined and intensified the variation in prior structure caused by cold work and recrystallization, and (b) the rate of heating to the carburizing temperature influences the austenitic grain size of cold worked specimens since the slower heating rates resulted in a coarser austenitic grain size than the faster rates of heating.

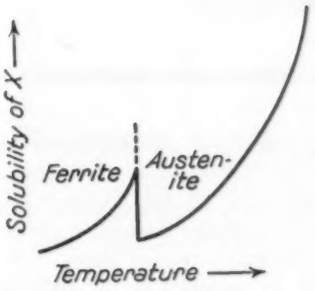


FIG. 6
HYPOTHETICAL curve of solubility of X in ferrite and austenite, as a function of temperature. (Dorn and Harder.)

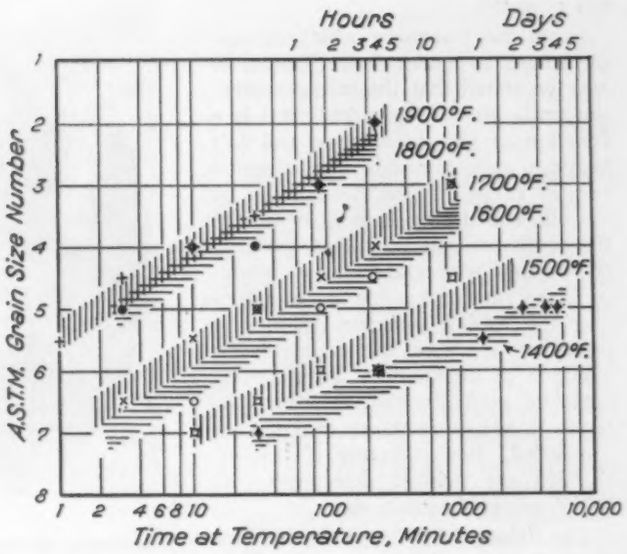


FIG. 7
EFFECT of time and temperature of heating on the austenitic grain size of a eutectoid steel. (Tobin and Kenyon.)

Since the degree of cold work has been shown to affect the coarsening range and the susceptibility to grain growth, it seemed advantageous to determine whether there existed any critical amount of reduction that would tend to establish the austenitic grain size. To ascertain this factor, four carburizing steels of the two per cent nickel-molybdenum type were hot rolled from a 3-in. square billet to a 0.303-in. round and then gradually cold drawn in successive steps, without any intermediate anneal, to a 0.160-in. diameter. The degree of cold drawing and the results obtained upon these steels after carburizing 8 hr. at 1700 deg. F. are tabulated in Table I.

The data in Table I, supplemented by other results, show that the austenitic grain size, as determined by the McQuaid-Ehn carburizing test, is well established after a 20 per cent cold draw, and subsequent drafting does not increase the grain size although a variation in carburizing time and temperature will markedly affect these results. This percentage of reduction (20 per cent) may be termed the "critical amount of deformation" and any reduction above this critical amount does not seem to greatly influence the austentic grain size of this type of steel. (Although steels A and B have a rating of 8 in the hot rolled state (0.303 in), they are predominantly 7, with few 8's, in the 0.270 in. rd.)

To summarize the effect of cold work upon the austenitic grain size, it may be stated that the austenitic grain size in cold worked steels is influenced by (1) the amount of reduction, (2) the rate of heating to the thermal critical range which controls recrystallization and grain growth in alpha iron, and (3), the time and temperature above the thermal critical range which in turn controls the austenitic grain growth.

Influence of the Rate of Heating upon the Austenitic Grain Size: Since the rate of heating in cold worked steels influences the austenitic grain size, it was determined to note whether the same trend maintained in unworked steels. A perusal of the literature showed that this effect was studied by numerous investigators. Grossmann[7] and Tobin and Kenyon[8] stated that the initial grain size of austenite is not appreciably affected by the rate of heating through the thermal critical range. However, Herty, McBride and Haugh[9] and Herty, McBride and Hollenback[10] showed that, in aluminum killed steels, the initial grain size is independent of the rate of heating; whereas, in un-killed steels, it is a function of the heating rate, and as the heating rate increases the initial grain size becomes coarser.

Dorn and Harder[11] verified the above conclusions on killed steels, after an extensive study of the effect of the various rates of heating through the transient range, and came to the following conclusions:

(1) A chemical substance (or substances), which Dorn and Harder called "X", results from deoxidation with aluminum and has, in general, the solubility trend indicated in Fig. 6.

(2) The inhibited austenite grain growth of aluminum killed steels is a result of the precipitation of this substance (or substances) in the grain boundaries of the newly formed austenite grains.

(3) The precipitation of the chemical substance (or substances) called "X" may occur by any of the following mechanisms: (a) heating at temperatures below the thermal critical range to produce maximum solubility of the grain growth inhibiting material in ferrite, (b) heating to a relatively high temperature and then at a lower temperature to produce a lower solubility of the inhibitor in ferrite; (c) heating directly from the saturation temperature (1250 deg. F.) of "X" or quenching from the saturation temperature and reheating rapidly results in a finer austenitic grain

than if the material were cooled slowly from the saturation temperature and reheated.

From the foregoing which is supplemented by other investigators, it may be stated that the initial austenitic grain size of unworked steel is a function of (1) deoxidation and (2) heating rate through the thermal critical range. If the deoxidation of the material during melting results in the contamination, or rather, alloying of the steel with grain growth inhibitors, the rate of heating is secondary and the initial austenite grain size immediately above the critical is a function of deoxidation. However, if sufficient grain growth inhibiting material is not present, as in rimming (un-killed) steel, the rate of heating through the critical determines the initial austenitic grain size.

The Effect of T^{max} upon Grain Size: Since the preceding paragraphs illustrated the influence of the rate of heating through the thermal critical range upon the *initial* austenitic grain size, the effect of T^{max} (maximum temperature) upon the *final* austenitic grain size is now considered fully, although it was briefly mentioned under the subject heading dealing with the effect of prior structure. In order to study the full effect of T^{max} upon the austenitic grain size and to understand its importance, the subject must be subdivided into two headings; namely, (a) the effect of T^{max} in normal atmospheres and (b) the effect of T^{max} during carburization.

(a) Since grain growth is a function of time and temperature, as will be discussed later, the influence of T^{max} upon grain size is also controlled by time (time at temperature). However, for constant time, the effect of T^{max} is shown in Table II by Tobin and Kenyon[9]. These results show that the austenitic grain size of eutectoid steel increases progressively with temperature (T^{max}) and also with time. This is illustrated graphically by Tobin and Kenyon in Fig. 7, where the results are plotted on a logarithmic scale.

(b) The effect of T^{max} during carburization is similar to (a) but is more intense since the process of carburizing usually involves a long time element (4 to 16 hr.), depending upon composition, case depth, carburizing temperature, size, etc. Consequently, for constant time during carburizing, the austenitic grain size increases more rapidly during carburization than in normal atmospheric conditions since the continuous impregnation of carbon in the ferritic matrix of the material progressively lowers the transformation range and coarsening temperature. As a result of this automatic change during the carbon impregnation, grain growth flourishes more freely in the areas subjected to carburizing (case) than in the unaffected portion of the material (core). This effect (T^{max}), however, cannot be predicted from the McQuaid-Ehn carburizing test alone but from a *series* of carburizing tests using constant time and temperature similar to the McQuaid-Ehn test.

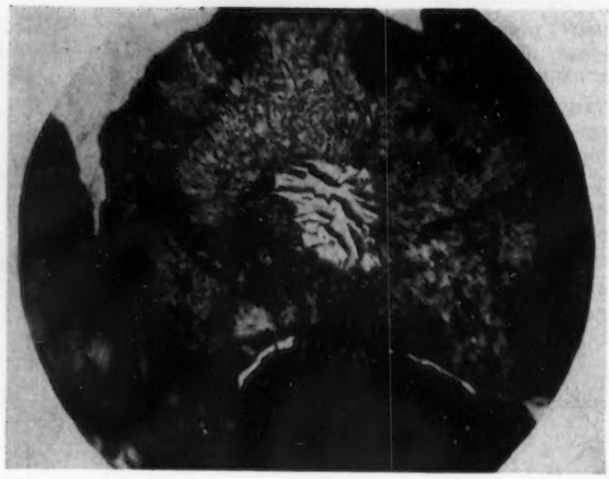


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FIG. 8

THE mechanism of the formation of an austenitic grain in nodular troostite. At 4000 diameters.

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Mechanism of the Austenitic Grain Growth: To complete the picture of the influence of the various factors upon the ultimate austenitic grain size and characteristics in steel, it is essential to understand the mechanism in which a ferritic grain transforms to an austenitic grain and how the final austenitic grain size may be predicted from its previous history.

Grossmann[7] first showed in annealed hypo-eutectoid steel that the austenitic nucleus originated in the pearlitic islands, or in the grain boundaries between the grains when they are heated through the transformation temperature. These nucleii gradually grow across the pearlitic areas and through the ferrite until the specimen is entirely austenitic.

Shapiro[8] also determined the manner in which the austenitic grains are formed in various heat treated eutectoid steels. In pearlitic steels, he observed, as Grossmann did, that the first austenitic nucleus usually formed in the grain boundaries and less often in favored locations in the grains. Whenever the austenitic nucleii formed within the pearlitic grain they were generally at right angles to the orientation of the cementite plates. Many instances were also observed where coarse white bands replaced the cementite plates and, upon continued heating, quickly formed austenitic areas which progressively dissolved the surrounding pearlite.

In spheroidized steels (quenched and tempered), Shapiro revealed that the areas around certain cementite

TABLE II

Austenitic Grain Size (A.S.T.M. Standard Nos.) After Various Heat Treatments

Temperature in Deg. F.	Time at Temperature, in Minutes										
	1	3	10	30	90	240	900	1500	3000	4500	5520
1400	...	...	...	7	...	6	6	5½	5	5	5
1500	...	...	7	6½	6	6	4½	...	.	.	.
1600	...	...	6½	5	5	4½	3	...	.	.	.
1700	...	6½	5½	5	4½	4	3	...	.	.	.
1800	...	5	4	4	3	2	...	...	.	.	.
1900	5½	4½	4	3½	3	2	...	...	.	.	.

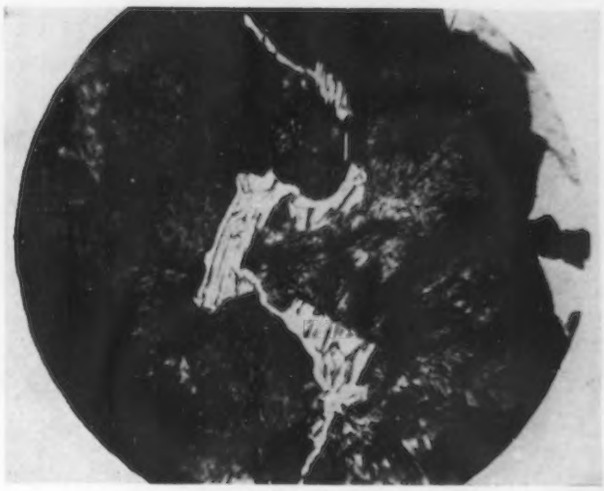


FIG. 9

THE mechanism of the formation of an austenitic grain in nodular troostite. At 4000 diameters.

spheroids gradually transform and form a gamma grain boundary which continually dissolves the surrounding and enclosed material to form an austenitic area if sufficient time at temperature is given.

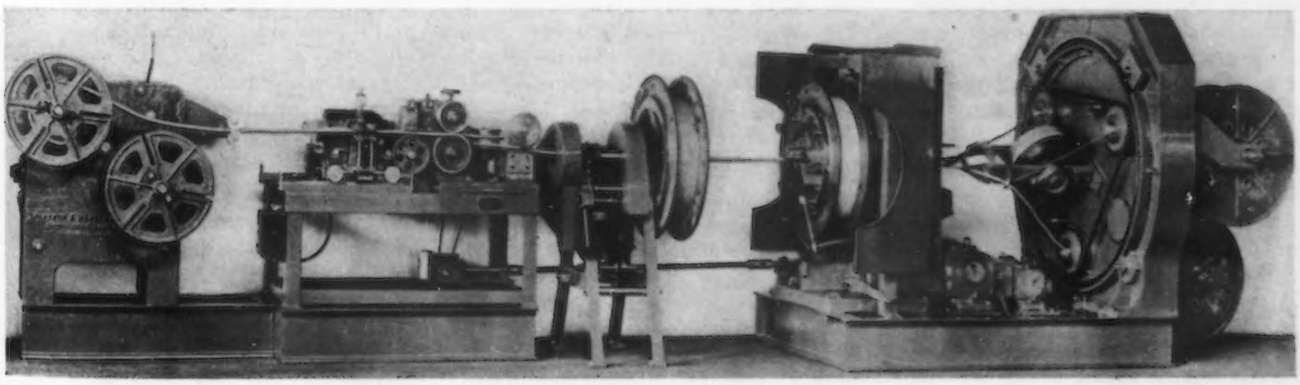
Transformation in troostitic steels (oil quenched) was shown to begin either in the center of the troostite nodule or at the grain boundaries. The formation of an austenitic nucleus in the center of a troostite nodule is shown in Fig. 8. Fig. 9 reveals the formation of a gamma grain boundary from the nucleus in the troostitic nodule. These areas grow continually with time and temperature until the entire specimen becomes austenitic.

From the foregoing discussions describing the various factors which influence the austenitic grain size and the manner in which the initial austenitic grain is formed, it suffices, therefore, only to state that the final austenitic grain size of any steel is influenced by: (1) prior structure or initial grain size, (2) mechanical deformation (hot and cold work) which remains or is conferred upon it during austenitizing, (3) the rate of heating to the austenitic condition, (4) time and temperature of heating (T^{max}), (5) method of deoxidization and (6) the type of inhibitors resulting from the deoxidization process. These factors may either intensify or minimize one another's effects and thereby may either refine or increase the austenitic grain size, depending on whether they act in a like or opposite manner.

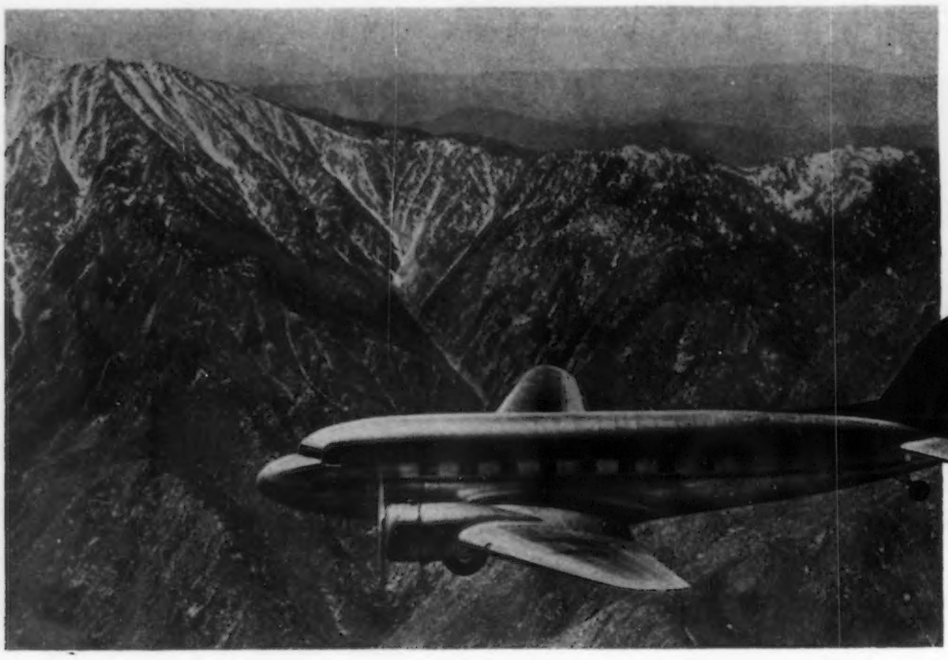
These initial austenitic nucleii, formed in their own characteristic manner in the various aggregates, grow as fast as time and temperature permit. If all things are equal, the finer grains grow faster than the coarser until they reach the same size and then, with further heating (time or temperature), the finer initial grained steel becomes coarser than the originally coarse material. This latter statement has been borne out in many experiments and may be attributed to the fact that the inhibitors, which originally cause grain refinement, induce grain growth once a certain critical temperature range is passed. This so-called critical temperature range where grain growth flourishes is determined by the type of inhibitors used in deoxidation, e. g., vanadium, aluminum, etc. As a result of this tendency, the fine grained steels at temperatures in excess of 1900 deg. F. form a coarser austenitic grain size than the originally coarse material. This rule does not hold for all steels but has been observed mostly in fully-killed basic electric steels.

Ed. Note: The third and last section of this article, dealing with the effect of the austenitic grain size upon the physical properties of steel, will appear within the next two issues.

TWO or three strands of insulated conductor wire are twisted and wrapped with insulating paper, then armored with galvanized steel strip and cut to designated lengths in this new combination cable armoring machine, recently built by Sleeper & Hartley, Inc., of Worcester. The spools of wire are mounted on the strander head at the extreme right. The armoring strip stock is supplied from a split spool which, when empty, may be removed from the head without necessity of cutting. The spooler, third in line, has a hollow spool spindle with rotating head and quick-release jaw. It is equipped with a double screw traverse mechanism that lays the desired width of strip stock on the spool. Full spools, after winding, are shifted from the spool to the armoring head by means of a chain fall. The measuring device and cut-off saw operate automatically while the machine is in operation.



TAKE-UP CUT-OFF SPOOLER HEAD STRANDER



LIGHT *for*

THIS article cannot possibly fully pursue more than a limited number of aspects of light alloys for aircraft. The intention is to deal briefly with the more generally discussed features of the subject, and then introduce a number of features on which less has been publicly said or written.

The production of aircraft components as castings commends itself forcefully, owing to the ease of production in large quantity and to the favorably low cost, as compared with wrought forms. The present high degree of efficiency of X-ray examination has contributed substantially to the production of sound castings in two important ways. In the first place it has provided a means of examination of individual castings for defects, and it has achieved a second and probably more important result in providing the manufacturer with a practical aid in developing the best methods of producing the casting concerned. Experience indicates that for success, it is necessary that a design should be evolved with due consideration of the duty to be performed and of the requirements of the foundry for the production of a satisfactory casting. This means that the designer and founder must collaborate in the evolution of a satisfactory design for a casting in an alloy best suited to the general requirements. As regards castings for important components subjected to stresses in service, the following are important features:

(a) The static strength properties that can be relied upon to be developed in each particular casting.

(b) In many applications the ability of the material to withstand fluctuating or alternating fatigue stresses.

(c) The effects of occasional overloading, e.g., brittle fracture or plastic deformation.

(d) The permanence of the casting under operating conditions.

For the use of castings as components performing such important duty that failure of a particular casting might imperil the entire aircraft, it will be appreciated that very high standards of quality are necessary. On the other hand, the applications of castings in aircraft are becoming increasingly numerous and the duties to be performed more and more vital.

Aluminum alloy castings of several different types are used for aircraft purposes, the heat-treatable casting alloys forming a very important group today. This group may be sub-divided into casting alloys heat treated at low temperatures only, and casting alloys solution heat treated and then given low temperature treatment.

The low temperature heat treatment lowers the elongation value without rendering the castings unduly brittle, but usually increases the ultimate stress slightly and the proof stress appreciably. These effects arise from age-hardening at the raised temperature of heat treatment, the cooling from the liquid state in the mold resulting in some retention of a solid solution condition. An important practical advantage lies in the fact that internal casting stresses are released to an appreciable extent and danger of future distortion is much reduced.

Double heat treatment, i.e., solution heat treatment followed by aging at elevated temperature, is applied to a number of important alloys, principally for the development of high strength properties. This frequently entails precautions against distortion at the moment of quenching, especially for the larger castings. In general, the double heat treatment effects substantial increases in the ultimate and proof tensile stresses with decrease of elongation value, together with improved machineability.

There is an increasing use of castings in pressure systems and pressure tightness is here all important. Microporosity of the inter-dendritic shrinkage type is frequently not discernible by radiography. In light sections in particular, this type of porosity is liable to be troublesome. Castings

* Abstract of lecture before the Midland Metallurgical Societies, Birmingham, England.

ALLOYS

Aircraft

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MODERN aircraft is a product of the metallurgists skill and careful adaptation on the part of the plane builder. Many alloys are now used: the single and double heat treatment types of duralumin and magnesium alloys of many types, including alloys carrying cerium and cobalt. Service failures of such light alloys are remarkably rare.

o o o

By H. SUTTON
Chief Research Chemist, Aircraft Research Board, England

pressure tight to air and mobile liquids represent a field in which there seems to be great scope. For a very wide range of small components there is frequently not the same need for very high strength, and heat treatment is generally not so necessary as for larger components. The high silicon type of aluminum casting alloy is used for aircraft parts in which high intrinsic resistance to corrosion is required.

The proof stress and ultimate stress values are raised substantially by the double heat treatment and moderately in the case of single heat treatment. As indicated by the results of both laboratory tests and service experience, the corrosion resistance is not seriously impaired by the heat treatment, while the machining properties are improved. The high magnesium type of aluminum casting alloy amenable to the double form of heat treatment and developing high strength properties is an interesting recent development. The basic alloy containing 4 to 4.6 per cent of copper and up to 0.9 per cent of silicon with small amounts of other elements, gives good response to heat treatment of both the single and double types. The strength properties are high for aluminum castings and the elongation value of the single heat treated material is high for a sand cast aluminum alloy.

In the field of the wrought aluminum alloys, duralumin and alloys of the duralumin type remain the most important type of high strength single heat treatment alloy. This type of alloy is very well known, but demands some attention. The fact that it has been known so long and used so extensively is, in itself, a tribute to the value of the material. As with other materials, experience and the industrial application of the results of research have yielded an improved product. In recent years there have been many developments in this field of light alloy technology. The alloys are available in the form of sheets, bars and extrusions. They have high ultimate and 0.1 per cent tensile proof stresses, good working properties and high resistance to corrosion. The improved mechanical properties compared with duralumin are obtained by very slightly increased amounts of alloying elements, notably magnesium and suitable control of the other added elements.

Duralumin Improved

The double heat treatment type of improved duralumin alloy has found extensive use in modern aircraft. Here the optimum mechanical properties are obtained by applying first a solution heat treatment and then an aging treatment at raised temperatures, say 15 hr. at 330 deg. F. As a result of the elevated aging treatment, the ultimate stress is usually raised slightly and the 0.1 per cent tensile proof stress appreciably, the ductility being reduced slightly. The corrosion properties are affected adversely, notably as regards resistance to the intercrystalline type of corrosion. On the other hand the alloys are capable of being used satisfactorily if suitable protective treatment and coatings are applied. The aluminum clad material is outstanding in that respect, the resistance to corrosion and to mechanical deterioration being much increased by the aluminum coating.

Mention should be made of a new high strength wrought aluminum alloy of recent origin. The alloy contains 4 to 6 per cent zinc, 2 to 4 per cent magnesium, 1.5 to 3 per cent copper, up to one per cent nickel and small amounts of other elements. At present the alloy is being supplied in the form of extrusions which, after an appropriate double heat treatment, have strength properties of the order of 60,000 to 74,000 lb. per sq. in. tensile proof stress, and 74,000 to 85,000 lb. per sq. in., ultimate tensile strength, with 10 to 16 per cent elongation. The specific gravity is about 2.8. The alloy, in this condition, appears to possess good resistance to corrosion, as judged by laboratory tests. The results of practical experi-

ence of this material will be awaited with interest.

For hulls and floats of sea-going aircraft constructed in light alloy, aluminium coated sheets are widely used. The present stage of metal aircraft development involves extensive use of these high strength light alloys not only for skin coverings, but also for ribs, stiffeners, spars, and a wide range of stressed members. For skins, resistance to wear and tear in service and handling may place the stronger alloys in a position of advantage. The extensive use of extruded forms for spars, frames and stiffeners is perhaps the most outstanding development at the present time.

For many components, good bending and forging properties are necessary. There is a wide range of aluminium alloys possessing excellent working properties from which the designer may choose his material according to the strength properties desired in the finished component and the method of manufacture. Most of these materials possess high resistance to corrosion.

Present specifications indicate to some degree the position attained by modern magnesium alloy castings as regards physical properties. The benefits of heat treatment are very marked here and more marked in the results of practical experience than the specified mechanical properties for test bars would suggest. In the light of present experience, these values that are specified can be exceeded appreciably. The author believes that the improved ductility of solution heat treated magnesium alloys has contributed substantially to the success and reliability of the castings in service. In the case of aircraft landing wheels, for instance, there has been abundant experience to show that the castings, suitably designed and executed, can give satisfactory service under conditions of shock loading.

The quantity of magnesium alloy castings used in aircraft is now very large and appears likely to increase further. The low density of the alloys, the mechanical properties, good general standard of quality attainable in castings and the excellent machining properties are all important practical points to the aircraft constructor. Further, the modern methods of protection against corrosion coupled with the higher intrinsic resistance of the alloys have permitted satisfactory service life to be obtained under all except the most extreme conditions of use. It would be misleading if one were to give the impression that there were no difficulties or that failures did not occur. These have occurred with most aircraft materials. Application of suitable scientific and technical principles, when these dangers are realized, is doing much to overcome troubles.

Porosity of magnesium castings has given some trouble especially when designers have been too ardent in saving weight. The best treatment of the problem of porosity in castings is that which leads to its elimination. Advances have been realized in pressure tightness of magnesium alloy castings by the development of alloys of suitable composition, and with improved technique of design and in casting are bringing magnesium alloy castings into use in pressure systems. A new alloy has been developed specially for castings required to be pressure tight. This is a 3 to 10 per cent tin, 2 to 6 per cent aluminium, 0.25 to 4.0 per cent silver, magnesium alloy. Sand cast test bars have a proof stress 0.10 of about 9000 lb. per sq. in., an ultimate stress of 20,000 to 27,000 lb. per sq. in. and elongation 4 to 7 per cent. It is claimed that this alloy yields castings having uniform properties.

Magnesium Alloys Workable

Magnesium alloy sheets of two types are used in aircraft work. The first type, is made in the alloy containing about 2 per cent of manganese. The second type is in the aluminium-magnesium alloy and contains up to 9 per cent of aluminium, up to 1.5 per cent of zinc and up to 1.0 per cent of manganese. Simple bending and shaping operations can be performed in the cold, but most operations of forming and shaping are carried out on heated material. Both these materials can be welded with the acetylene torch using a suitable flux and filler rod of the same alloy. Development work now in progress on an improved alloy of the same family appears likely to provide an alloy capable of being worked more severely at normal temperatures. Magnesium alloy forgings, stampings and bars afford material of 20,000 to 25,000 lb. per sq. in. proof stress and 31,000 to 38,000 lb. per sq. in. ultimate stress. New developments indicate that these properties can be improved and that stronger alloys will be available.

Magnesium alloy propeller blades have shown remarkable progress. The alloy used for the modern magnesium alloy propeller blade contains 8 to 9.5 per cent of aluminium and small amounts of zinc and manganese. The blade blanks are the product of powerful presses. The form of a propeller blade of the detachable type is one that does not make easy the production of forgings having uniform properties at all parts. The labors of those concerned in the production of these forgings have been fruitful however, in yielding a product of very uniform properties indeed. A point of major practical importance in connection with practical applications is recognition of the notch sensitivity of magnesium-rich alloys in both cast and wrought forms. Sharp corners and sudden changes of section must be avoided.

Cerium Used in Pistons

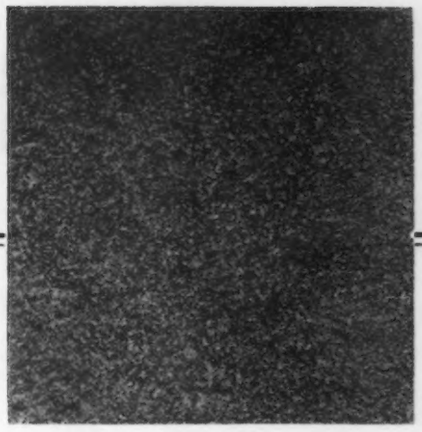
The cerium-cobalt-magnesium alloys recently evolved are of special interest for parts subjected to raised temperatures and seem likely to take the magnesium alloy piston a considerable step forward.

Aircraft structures are designed so that they will not collapse before withstanding external loads corresponding to the specified ultimate factor. The structure must be in an airworthy condition after carrying 75 per cent of the ultimate loads for one minute. This load is known as the proof load. Members in tension are designed on the ultimate strength of the material. The ultimate factor is based on the ultimate stress and the proof factor on the 0.1 proof stress. For members stressed in compression, the ultimate factor is estimated from strut formulae based on the 0.2 per cent proof stress. It can generally be assumed for such members that compliance with the ultimate factor requirement will automatically ensure compliance with the proof factor requirement.

Owing to the necessity for keeping weight down to a minimum, considerable care has to be taken in structures to make the most economical use of material. This leads to the use of thin sections. The increased need of torsional wing stiffness due to the speeds of modern aircraft has led to the development of stressed skin construction. The use of thin sections introduces a risk of instability failures due to buckling of the material at stresses well below those which the material can develop in thicker sections. This type of instability has usually to be predetermined from mechanical tests of suitable sections. The stability of these thin sections is more

(CONCLUDED ON PAGE 92)

SAG WRINKLE—Medium



OPALESCENCE WRINKLE—Medium

VERSATILE EFFECTS *with* WRINKLE FINISH

BECAUSE of the unusualness of wrinkle finishes, there is a tendency to feel that they are difficult to apply in order to obtain uniform results. This is not the case, according to one maker of this type of finish, New Wrinkle, Inc., Dayton, Ohio. It is said that such finishes are among the easiest to use, there being only two things that must be watched —a clean spray gun nozzle and uniform heat throughout the oven.

It is furthermore stated that, (1) the product finisher does not have to be as careful about avoiding "sags" or "runs," (2) there is no need to be so careful about dirt or dust in his finishing room, (3) if there should be flaws in a wrinkle finished surface, they are not apparent to the naked eye, (4) wrinkle finish is a one coat application, and (5) inexpensive base metal may often be used as wrinkle finish fills all of the seams and hides other flaws under a single coat.

Regardless of the wrinkle effect desired, one caution has to do with the colors selected. When pastel shades are chosen care must be exercised against overheating. Because of pastels being delicate, too much heat has a tendency to burn the colors, but this is not true of standard colors as their pigments are basic.

Sag wrinkle has the appearance of draped curtains, as shown in the accompanying illustration. It is a combination bakelite, varnish and synthetic base, and when applying this finish to metals and other materials which will stand heat, it must be sprayed heavy enough to create "runs." It is then baked at 225 deg. for 3 hr.

Pine tree wrinkle, as its name implies, looks like miniature pine trees uniformly distributed over the entire finish area. Heavy, medium or small design is governed by the amount of material sprayed, adjusted at the nozzle of the spray gun. It is caused by very small "runs" which set immediately heat is applied, and requires a bake of 3 hr. at 225 deg.

Uniform wrinkle is the typical small wrinkle more universally applied. It establishes a uniform design over the entire finished surface with each individual wrinkle identical in size and character. Typical products on which this wrinkle finish is used include automobile radios, air conditioning equipment, heating units, metal boxes of all kinds, medicine cabinets, business machines, etc.

Opalescence wrinkle is the same basically as uniform wrinkle. (See accompanying illustration.) The difference in finish is acquired by adding opalescence to the uniform wrinkle formulations to give them a more variant color effect such as an iridescent array of pearl-like colors, as contrast to solid colors.

"Birdseye," or "fisheye," describes a wrinkle finish of exceptional character to be found on such products of high quality as laboratory equipment, aircraft instruments, coin banks, beauty parlor equipment, clocks, door chimes, etc. Such wrinkle requires more care in application than any of the other wrinkle finishes, but does not offer complications if the product finisher practices judgment in its use.

While varying effects are obtained based on the size of the "eyes" desired, but one formulation is required. The variation is derived from the amount of material sprayed. The product is then put into the oven and baked for ½ hr. in a heat of 100 to 150 deg. This sets the "eyes" and it is now ready for a 3-hr. bake at 225 deg.

HAND MOTIONS for Small

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MANAGEMENT in industry has been slowly developing from an art into an applied science. Today industrial managers and industrial engineers, to an increasing extent, look to the basic sciences for data to use in solving their practical problems. Since all manual work consists of various combinations of but 18 fundamental motions, it has seemed logical to make investigations of some of the most important of these motions with the purpose of finding fundamental data that might have wide use.

The data given herein represent fundamental investigations of this nature. One section of the study deals with the time required to handle small parts, and is subdivided into (1) a study of the time required to grasp washers from a flat surface using a "hook" grasp and a "pinch" grasp, and (2) a study of the time required to grasp machine screw nuts and machine screws from various types of bins. The second section of the study deals with a study of the time required to assemble screws with the three different types of screwdriver bits.

It should be particularly noted that general conclusions could safely be based only on investigations of a much broader scope than presented herein, and these studies are therefore primarily indicatory in nature.

From analyses of the movements of the various members of the human body performing many different kinds of work, it has been found that all motions may be divided into 18 different well defined classes. These 18 fundamental motions or therbligs[1] are widely known and will be used in this study.

The therbligs together with their mnemonic symbols are as follows:

(1) Search (Sh.) *Search* refers to that part of the cycle during which the eyes or the hands are groping or feeling for the object. *Search* may be performed with either the eyes or the hands.

(2) Find (F.) *Find* occurs at the end of the therblig *search* and represents more of a mental reaction than a physical movement.

(3) Select (St.) *Select* refers to the choice of one object from among several. In many cases it is difficult if not impossible to determine where the boundaries lie between these first three therbligs. For this reason it is usually the practice to combine them, referring to the group as the one therblig *select*.

Using the broader definition, *select* then refers to the searching, finding, and selecting of an object. *Select* usually occurs between the therblig *transport empty* and the therblig *grasp*. However, there is no therblig *select* when parts are *prepositioned* for in such cases *transport empty* is followed directly by *grasp*.

(4) Grasp (G.) *Grasp* refers to taking hold of an object, closing the fingers around it preparatory to manipulating it, picking it up, or holding it. This therblig begins when the hand or fingers first make contact with the object being grasped and ends when the hand or fingers have reached the position necessary for the performance of the next therblig.

(5) Transport Loaded (T.L.) *Transport loaded* requires that a change in the location of an object be made. It is the moving of an object from one place to another. The object may be carried in the hands or fingers or it may be moved from one place to another by sliding, dragging or pushing it along.

(6) Position (P.) *Position* consists of turning or locating an object in such a way that it will be properly oriented to fit into the location for which it is intended. It is possible to position an object during the therblig *transport loaded*. The carpenter, for example, may turn the nail into position for using while he is carrying it to the board into which it will be driven. *Position* usually follows the therblig *transport loaded* and precedes the therblig *use*.

(7) Assemble (A.) *Assemble* consists of placing one object into or on another object with which it becomes an integral part. The therblig begins as the hand starts to move the part into its place in the assembly. The motion ends when the hand has completed the assembly and just begins to release the part.

(8) Use (U.) *Use* may refer to an almost infinite number of particular cases. It always consists of manipulating a tool, device, or piece of apparatus for the purpose for which it was intended. *Use* is the most important of all therbligs. It represents the therblig for which the preceding therbligs have been more or less preparatory and for which the ones that follow are supplementary. *Use* begins the instant the hand applies itself in manipulating a device in such a way that the device functions for the purpose it was intended and ends the instant the hand ceases the application and begins the next therblig.

(9) Disassemble (D.A.) *Disassemble* consists of separating one object from another of which it is an integral part. The therblig begins when the hand starts to remove one part from the assembly. The motion ends when the hand has separated the part completely from the remainder of the assembly and begins the next therblig.

(10) Inspect (I.) *Inspect* consists of testing or examining some property of an object. *Inspect* is predominantly a mental reaction and may occur simultaneously with other therbligs.

(11) Pre-position (P.P.) This therblig is the same as *position* with the added qualification that *pre-position* refers to positioning an object in a predetermined place in such a way that it may be grasped in the position in which it is to be held when it is needed. This eliminates the therblig *position* which would otherwise be necessary after the object was grasped. Usually a holder, bracket, or special container of some kind is used for holding the object in a way that permits it to be grasped easily in the position in which it will be used. *Pre-position* is the abbreviated term used for *preposition for the next operation*.

(12) Release Load (R.L.) *Release Load* refers to that part of the cycle dur-

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* Extensive abstract of a report just issued by the University of Iowa, and a continuation of investigations reported in 1936 and 1938.

[1] Therblig is a word coined by Frank B. Gilbreth to designate the subdivisions or events that he thought common to all kinds of work. Although the 18 therbligs are not all pure or fundamental elements in the sense that they cannot be further subdivided, they are the best classification of hand motions available.

Assembly Work*

By RALPH M. BARNES and MARVIN E. MUNDEL
College of Engineering, University of Iowa

ing which the hand is letting go of the object grasped—letting it slip out of the hand. This therblig begins when the object starts to leave the hand and ends as the object has been completely separated from the hand or fingers.

(13) Transport Empty (T.E.) *Transport Empty* consists of moving the empty hand in reaching for an object. This therblig usually begins the instant the hand begins to reach for an object and ends the instant a part of the hand comes in contact with the object to be grasped.

(14) Rest for Overcoming Fatigue (R.) *Rest for overcoming fatigue* is a fatigue or delay factor or allowance provided to permit the worker to recover from the fatigue incurred by his work.

(15) Unavoidable Delay (U.D.) *Unavoidable delay* may result from either (a) a failure or interruption in the process, (b) a delay caused by an arrangement of the operation which prevents one part of the body from working while other members are busy.

(16) Avoidable Delay (A.D.) *Avoidable delay* refers to any delay of the operator for which he is responsible and over which he has control. It refers to delays which the operator may avoid if he wishes—(a) this therblig is assigned in most cases where there is an avoidable stopping of all motions of the hand, and (b) a delay is avoidable when it occurs in work that requires no delay.

(17) Plan (Pn.) *Plan* refers to a mental reaction which precedes the physical movement, that is, deciding how to proceed with the work.

(18) Hold (H.) The therblig *hold* has been used by some as a separate and distinct element. Strictly speaking, it is a form of grasp and was considered as such by Gilbreth. *Hold* denotes the retention of the object after it has been grasped, no movement of the object taking place.

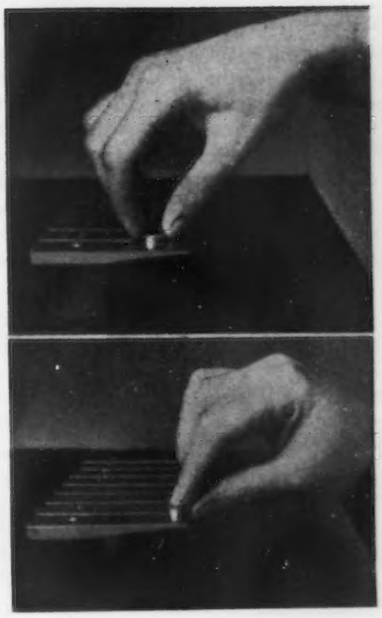


FIG. 1—Examples of grasp: Top—pinch or pressure grasp being used to pick up a brass washer 1/8 in. thick. Bottom—hook or lip grasp being used to pick up a brass washer 1/8 in. thick.

Time Required to Grasp Washers From a Flat Surface "Hook" Grasp vs. "Pinch" Grasp

THE object of this investigation was to determine the effect of washer thickness and manner of grasp upon the time required for grasp, transport loaded, position, release load, and transport empty, when moving washers from one flat surface to a second flat surface approximately *five inches closer to the operator.*

The washers used were circular, ½ in. in diameter with a ⅛ in. hole in the center. The following four washer thicknesses were used: 1/32, ⅛, ¼ and ½ in.

The flat surfaces from which the washers were grasped and on which they were deposited were in the form of grids made up of eight brass bars ⅞ in. wide, ¼ in. thick and 3 in. long. Fiber spacers, ⅛ in. wide, were used to insulate each brass bar electrically from the others. The bars and the spacers were glued together and firmly screwed to a base support as shown in Fig. 1. The top surface of this assembled plate was milled smooth and the spacers were undercut 1/32 in. so that the washers would make good contact with the brass bars. The bottom surfaces of all washers and the upper faces of the grids were coated with mercury to further insure good contact at all time between the washers and grids.

Seven washers were placed along the edge of the "grasp" grid, each directly over a fiber strip. A photoelectric cell was placed ⅝ in. above the grasp grid. Mechanical electrical recording equipment served to indicate the moment the operator reached down to grasp a washer (as light beam on photocell was interrupted), the moment a washer was removed from the grasp grid (as electrical contact was broken), and moment the washer was placed in a corresponding position on the "release" grid (as electrical contact was made). Time measurements were kept to the nearest thousandth of a second.

The sequence of therbligs for one cycle of the task was as follows: Pick up one washer from "grasp" grid (T_G), carry washer to second grid and position over fiber spacer ($T_{T.L.+P.}$), release washer on second grid and return to "grasp" grid ($T_{R.L.+T.E.}$).

Procedure.—Five male operators and five female operators were studied. The procedure was the same for both groups.

The operators were instructed to grasp one washer at a time in the following ways: (1) Hook Grasp (Lip)—the operator placed his index

finger on top of the washer and his thumb either slightly under or against the edge of the grid and drew the washer toward his thumb with his index finger, grasping it between the balls of the two fingers as the washer came over the edge of the surface; and (2) Pinch Grasp (Pressure)—the operator placed both his thumb and index finger in contact with the washer and lifted it off the grid.

During the runs for which data were taken the operators were instructed to do the task as rapidly as possible. Previous to the recording of the data each operator practiced 28 cycles with each washer using each method of grasping. He first practiced with washer No. 1, (1/32 in. thick) using a hook grasp performing 28 cycles and then practised 28 cycles with the same washer using a pinch grasp. He repeated this procedure with washer No. 2 (⅛ in. thick), washer No. 3 (¼ in. thick) and washer No. 4 ½ in. thick). All of this practice took place previous to the recording of any data. The operator then again practiced seven cycles using a hook grasp with washer No. 1 and then data were recorded for the next seven cycles. In a like manner data were recorded for washers Nos. 2, 3, and 4 using the hook grasp. Then, using a pinch grasp for washers Nos. 1, 2, 3, 4, again with 4, 3, 2, and 1 during these eight runs (and in these cases practicing with the manner of grasp for which data were recorded), and then again with washers Nos. 4, 3, 2, and 1 using the hook grasp (after practicing with this manner of grasp in these cases). Data were recorded in the order of enumeration given above.

The data from five consecutive cycles were analyzed from each of the two sets of seven cycles for each washer using each manner of performing the grasp.

Conclusions.—(Based on the results of both the male and female operators).

(1) Using the hook grasp (lip) the total cycle time tended to increase with increasing washer thicknesses.

(2) Using the pinch grasp the total cycle time tended to decrease hyperbolicly (when graphed, time vs. thickness) with increasing washer thicknesses, tending to approach a constant value as the washer thickness approached ½ in.

(3) The total cycle time curves intersect between ⅛ and 3/16 in. washer thickness, indicating that for washer thicknesses below this range the hook grasp is more efficient and for sizes above this range the pinch grasp is more efficient.

(4) The time for grasp using a hook grasp tended to increase slightly as the washer thickness increased.

(5) The time for grasp using a pinch grasp decreased markedly as the washer thickness increased.

(6) The time for transport loaded and position using a hook grasp increased markedly as the washer thickness increased.

(7) The time for transport loaded and position using a pinch grasp decreased markedly as the washer thickness increased.

(8) The time for transport loaded and position using either type of grasp tended to vary in a straight line relationship with the washer thickness (when graphed, time vs. thickness).

(9) The time for release load and transport empty, using either type of grasp tended to increase very slightly as the washer thickness increased.

Time Required to Grasp Machine Screw Nuts and Machine Screws From Various Types of Bins

THE object of this investigation was to determine the effect of the shape of the bin upon the time for the grasp and upon the time for the preceding transport empty and the subsequent transport loaded therbligs when the following small parts were taken from the bins: A, bright hexagonal machine screw nuts; and B, bright machine screws.

Hexagonal machine screw nuts, for machine screw sizes A.N.S. (American National Standard) 2, 4, 8, and 12 were used in the first part of the study; and bright machine screws ¾ in. long sizes (A.N.S.) 2, 4, 8, and 12 with slotted round heads were used in the second part of the study. Three different type bins were used: (1) a hopper type bin, (2) an ordinary rectangular bin resembling a box open at the top, and (3) a bin with tray attached. The three bins are shown in Fig. 2.

The distance from the bin from which the operator grasped the nut to the hole in the table top through which he released it. was approximately *five inches in all cases.* Beams of light impinging on photoelectric cells served to accurately time the instant of grasping and of releasing the nuts or screws.

The steps used in performing one cycle were as follows: Grasp part, i.e., nut or screw (T_G), move part toward "release" hole in table top ($T_{T.L.}$), drop part into hole in table top ($T_{R.L.}$), move hand to bin for next part ($T_{T.E.}$).

Procedure.—In part A of the experiment five male operators and five female operators were studied. In part B only five male operators were studied. The procedure for both parts and for all operators were identical.

The operators first practiced grasping 25 No. 2 nuts from the hopper type bin, then 25 No. 4 nuts, 25 No. 8 nuts, and then 25 No. 12 nuts from the same bin, all in that order. Only one size of nut was put into the bin at a time. The operator practiced grasping the same number of each size of nut in the same order from the rectangular bin and then from the bin with tray.

The operators then practiced grasping 15 No. 2 nuts from the hopper type bin and data for the next 20 grasps were recorded. In a like manner data were recorded for Nos. 4, 8, and 12 nuts being grasped from the hopper type bin, then Nos. 2, 4, 8 and 12 nuts from the rectangular bin, then Nos. 2, 4, 8 and 12 nuts from the bin with tray, then Nos. 12, 8, 4 and 2 nuts from the bin with tray, then Nos. 12, 8, 4 and 2 nuts from the rectangular bin, then Nos. 12, 8, 4 and 2 nuts from the hopper type bin, in the order given. The data from 15 consecutive cycles from each run with each size of nut with each bin were analyzed.

Part B of the study was carried out for the four sizes of machine screws in exactly the same manner as for the nuts. Five male operators were used for this part of the study.

Conclusions.—Part A (for machine screw nuts):

(1) The bin with tray produced the fastest grasp throughout the entire range of nut size studied. The hopper type bin required, on the average, 51 per cent more time for grasp, and the rectangular bin required, on the average, 58 per cent more time for grasp.

(2) The bin with tray produced the shortest total cycle time throughout the entire range of nut size studied. The hopper type bin required, on the

average, 21 per cent more time for a complete cycle, and the rectangular bin required, on the average, 28 per cent more time.

(3) The time for grasp, with the bin with tray, tended to remain constant independent of the size of the nut. The time for grasp, for the hopper and rectangular bins, decreased 19 per cent as the size of the nut increased from No. 2 to No. 12.

(4) The time for the transport loaded, following the grasp, tended to be at a minimum with the hopper type bin throughout the entire range of nut size studied. With the bin with tray, the transport loaded required, on the average, 6 per cent more time, and with the rectangular bin, on the average, 22 per cent more time.

(5) The transport empty, preceding the grasp, required the least time with the hopper type bin throughout the entire range of nut size studied. With the bin with tray, the transport empty required, on the average, 30 per cent more time, and with the rectangular bin bin the transport empty required, on the average, 54 per cent more time.

Conclusions.—Part B (for machine screws): (1) The bin with tray tended to produce the fastest grasp throughout the entire range of screw size studied. The hopper type bin required, on the average, 26 per cent more time for grasp, and the rectangular bin required, on the average, 16 per cent more time for grasp.

(2) The bin with tray produced the shortest total cycle time throughout the entire range of screw size studied. The hopper type bin required, on the average, 10 per cent more time for a complete cycle, and the rectangular bin required, on the average, 13 per cent more time.

(3) The time for grasp. with the bin with tray, decreased 15 per cent as the size of the screw increased from No. 2 to No. 12. The time for grasp with the hopper type bin also decreased 8 per cent for the same range of size while the time for grasp, for the rectangular bin increased 15 per cent as the size of the screw increased from No. 2 to No. 12.

(4) The time for the transport loaded, following the grasp, tended to be at a minimum with the bin with tray throughout the entire range of screw size studied. With the hopper type bin, the transport loaded required, on the average, 6 per cent more time, and with the rectangular bin, on the average, 32 per cent more time.

(5) The transport empty, preceding the grasp, required the least time with the hopper type bin throughout the entire range of screw size studied. With the bin with tray, the transport empty required, on the average, 5 per cent more time, and with the rectangular bin the transport empty required, on the average, 25 per cent more time.

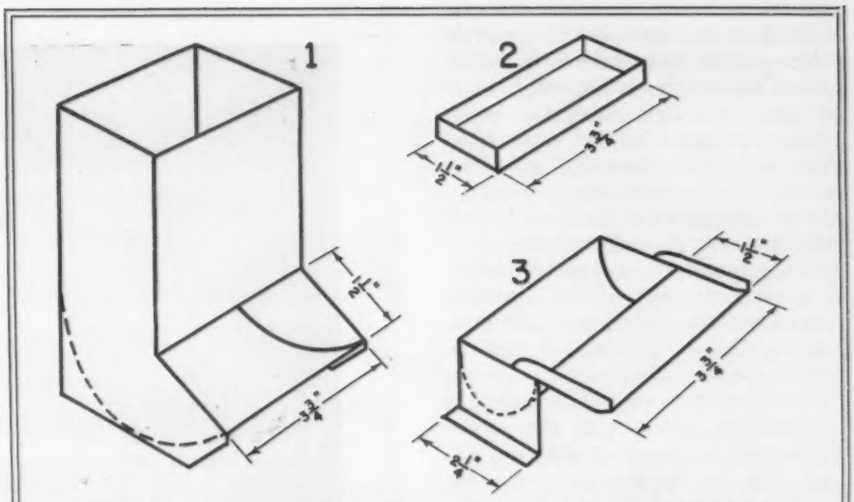


FIG. 2.—Types of bins. No. 1—hopper type bin; No. 2—ordinary rectangular bin; No. 3—bin with tray attached.

Time Required to Assemble Screws With Three Different Types of Screwdriver Bits

THE object of this investigation was to determine the relative efficiencies of different types of screwdriver bits in a quick-return spiral ratchet screwdriver; A—when used on screws that had already been started; and B—when used on screws that had not been started.

Three different screwdriver bits were tested, as shown in Fig. 3; A—a special bit to fit No. 8 round head machine screws with recessed head; B—ordinary blade bit with self-centering attachment, as shown in Fig. 4; and C—ordinary blade bit. Both bits B and C fit No. 8 slotted round head machine screws.

New steel machine screws with the following specifications were used in the study: No. 8-32, ¾ in. long, coarse threads, round head, bright finish with slotted heads and with recessed heads.

A quick-return spiral ratchet screwdriver, model No. 135, 13½ in. long when extended, was used with each of the three different bits. The same screwdriver was used for all of the studies.

Before the operator started working, the screws were screwed ¼ in. into nuts permanently set into a wheel. This wheel was mounted edgewise to the operator. By means of a slide with a projecting pin, and holes in the side of the wheel, the operator was able to index the wheel so that each screw he worked on would be standing vertically. The positioning time (the time to line the screwdriver bit up with the slot or recess in the head of the screw) was determined by means of a beam of light, projecting across the head of the screw (standing vertically) and impinging upon a photoelectric cell. While the operator was indexing the wheel, he put the screwdriver into a holder nearby. The screwdriver and the holder were so wired that the instant it was inserted into or removed from the holder a time recording on a tape was made to the thousandth of a second.

When the operator had finished indexing the wheel, he grasped the screwdriver with his right hand and lifted it out of the holder. The lifting of the screwdriver opened an electric circuit and actuated a timing mechanism. This point marked the beginning of the transport loaded (screwdriver

toward the screw) and was also considered as the beginning of the cycle. The operator then carried the screwdriver toward the screw and brought it down vertically upon the screw. When the point of the screwdriver bit was 7/16 in. above the head of the screw standing vertically, the screwdriver bit interrupted the beam of light falling on the photoelectric cell which again actuated the timing mechanism. This was the end of the transport loaded and the beginning of the positioning time. The operator then inserted the bit into the slot or recess in the head of the screw and when he touched the screw with the screwdriver bit. he closed an electrical circuit, and this marked the end of the position and assemble and the beginning of the use therblig.

The operator then ran the screw down tight and disengaged the screwdriver. As long as the screwdriver bit was in contact with the screw, the timing mechanism continued, but with the removal of the screwdriver (disassemble) the circuit was broken, and the operator began the transport loaded toward the screwdriver holder over which he pre-positioned the screwdriver and into which he put it. As soon as he put the screwdriver into the holder, the weight of the screwdriver closed the circuit, which marked the end of the transport loaded (toward holder) and pre-position and the beginning of the release load, (let go of screwdriver) and the indexing of the wheel. When the operator again grasped the screwdriver and lifted it, the circuit is broken, which marked the end of the release load and index wheel.

The operator grasped the screwdriver head with his right hand and used his left hand for a bottom guide in positioning and using the screwdriver and used both hands to index the wheel, the left hand drawing back the slide and the right hand turning the wheel.

The steps used in performing one cycle were as follows: Carry screwdriver to within 7/16 in. of head of screw ($T_{T.L.}$), position and insert screwdriver bit into slot or recess in head of screw ($T_{P.+A.}$), run screw down tight and disengage screwdriver from screw ($T_{U.+D.A.}$), carry screwdriver to holder and pre-position ($T_{T.L.+P.P.}$), release screwdriver into holder, index wheel, return for screwdriver and grasp it ($T_{R.L.\ etc.}$).

The equipment used in making part B of the study was identical with that used in part A with the exception that a bin with tray attached was provided for the screws. The operator grasped a screw from the bin with the left hand while the right hand grasped the screwdriver. The left hand positioned the screw directly above the nut while the screwdriver bit was being assembled into the screw slot.

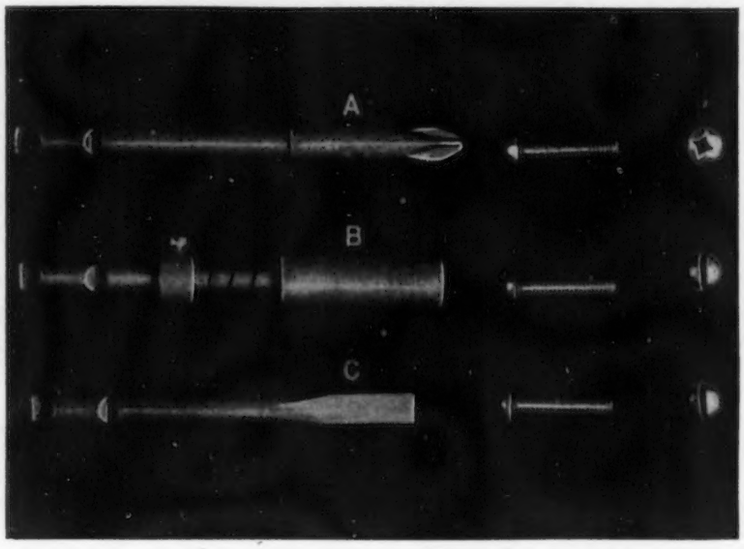


FIG. 3.—Three types of screwdriver bits tested. A—special bit for use with screws with recessed head; B—ordinary blade bit with self-centering attachment; C—ordinary blade bit.

The main difference was that in this study the operator had to start the screw into the hole as well as run it down tight.

The method of analysis of the data was the same as in part A; however, in this case the order of therbligs and recordings was as follows: Carry screw with left hand to hole (nut in wheel) and at the same time with right hand carry screwdriver toward screw ($T_{T.L.}$), position screw over hole and screwdriver over screw and insert bit in slot or recess ($T_{P.+A.}$), run screw down into hole tight with driver and remove driver from slot or recess in screw ($T_{U.+D.A.}$), carry screwdriver to holder and pre-position ($T_{T.L.+P.P.}$), release screwdriver into holder, index wheel, return for screwdriver and grasp it with right hand and grasp a screw with the left hand ($T_{R.L.\ etc.}$).

Procedure. — The operators first practiced running down 12 screws, (the total number on the wheel) with bit A, then 12 screws with bit B, and finally 12 screws with the ordinary blade bit C. In Part A the screws were always all started prior to the operator's working on them and always required ½ in. of running down to be made tight. In Part B the screws were not previously started. Recessed head screws were used with the special bit A and slotted screws were used with the other two bits. After this practice, the operator ran down 24 screws with the ordinary blade bit C, the data for the last 12 being recorded. The operator then ran down 24 screws with the blade bit B with the self-centering attachment, the data for the last 12 again being recorded. In a like manner data were recorded for a similar number of screws with the special bit A, again with the special bit A, then with bit B, and finally with the ordinary blade bit C, all in that order.

The operators rested for about three minutes after each 12 screws while the set-up was being made ready for the next run. The operators were all male college students, familiar with the use of common tools and all right-handed.

Results.—The data were all taken from the strip of paper moving at uniform velocity under the solenoid operated pencils of the electrical recording kymograph. Ten consecutive cycles from each run with each screwdriver bit with each operator were analyzed and tabulated. Measurements were made to a thousandth of

a second. The median value of the time required, by each operator, working with each bit, to carry the screwdriver to the screw, position and assemble it to the screw, run the screw down, and disengage the screwdriver was computed on the basis of the time required for the total of these therbligs. The median value of the time for the total cycle was computed on the basis of the total cycle time.

The median values were used in preference to the averages because the operators were only partly skilled and the medians would be less affected than the averages by isolated extremely high or low values. Since there were 20 analyzed cycles for each operator working with each bit, this necessitated averaging two cycles to obtain the median. The times for the individual elements of these two selected cycles were averaged to obtain the breakdown of the median.

Conclusions — Part A. — (Screwdriver bits used on screws that had already been started).

The following conclusions are based on the results of the tests conducted in the manner described on the preceding pages. No general statements with regard to the superiority of one screwdriver bit or type of screw over another is intended.

(1) It appears that both the special bit A (for use with recessed head screws) and the ordinary blade bit B with a self-centering attachment are considerably superior to the ordinary blade bit C for use on work of this type.

(2) The time to carry the screwdriver toward the screw, position it over the screw, assemble it to the screw, run the screw down ½ in. (till tight), and disengage the screwdriver, (transport loaded, position, assemble, use and disassemble) was at a minimum when the blade bit with the self-centering attachment was used. When the recessed head screws and bit A were used this group of therbligs required 10 per cent more time; and when the ordinary blade bit C was used, 24 per cent more time was required than with the blade bit B with the self-centering attachment.

(3) The time to move the screwdriver toward the screw, from the holder to within 7/16 in. of the head of the screw (transport loaded), was at a minimum when the blade bit with the self-centering attachment was used. When the special screws and bit A were used the transport loaded required 33 per cent more time; and when the ordinary blade bit was used, 28 per cent more time was required than with the blade bit with the self-centering attachment.

(4) The time between the instant the end of the screwdriver bit was 7/16 in. from the head of the screw and the instant the bit made contact with the screw, (position and assemble), was at a minimum when the blade bit with the self-centering attachment was used. When the special screws and bit A were used the position and assemble required 90 per cent more time, and when the ordinary blade bit C was used 194 per cent more time was required than with the blade bit B with the self-centering attachment.

(5) The time required to run the screw down tight, (½ in.), and disengage the screwdriver from the screw, (use and disassemble), was at a minimum when the blade bit B with the self-centering attachment was used. With the special screws and bit A, 3 per cent more time was required for the use and disassemble; and with the ordinary blade bit C, 17 per cent more time was required than with the blade bit B with the self-centering attachment.

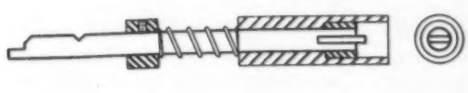


FIG. 4—Cross-section of ordinary blade bit with self-centering attachment.

Conclusions—Part B.—(Screwdriver bits used on screws that had not been started).

The following conclusions are based on the results of the tests conducted in the manner described on the preceding pages. No general statements with regard to the superiority of one screwdriver bit or type of screw over another is intended.

(1) It appears that both the special bit A (for use with recessed head screws) and the ordinary blade bit B with a self-centering attachment are considerably superior to the ordinary blade bit C for use on work of this type.

(2) The time to position the screw over the nut in the wheel and position the screwdriver over the screw, assemble it to the screw, run the screw down tight, and disengage the screwdriver (position, assemble, use, and disassemble), was at a minimum when either the blade bit B with the self-centering attachment or the special bit A was used. (The averages of the median values for the five operators tested shows less than one per cent difference between the time required with these two bits). When the ordinary blade bit C was used, 21 per cent more time was required for performing these therbligs.

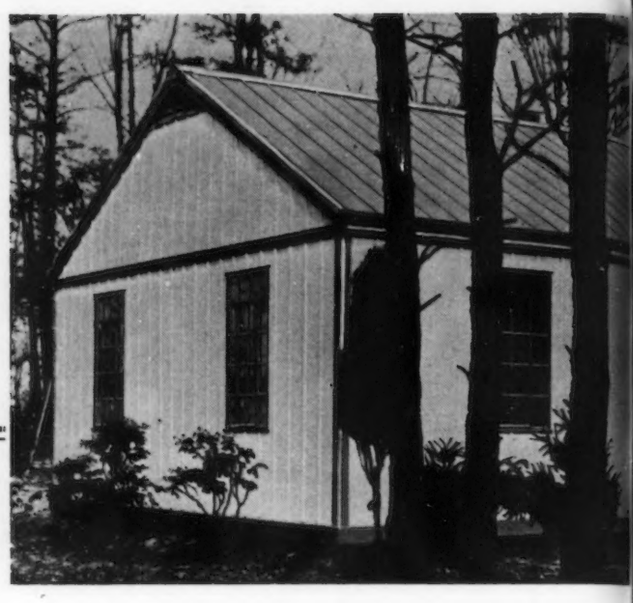
(3) The time between the instant the end of the screw was brought over the nut on the wheel and the instant the bit made contact with the screw standing over the hole in the hole in the nut (position and assemble) was at a minimum when the blade bit with the self-centering attachment was used. When the ordinary blade bit C was used, the position and assemble required 5 per cent more time, and when the special bit A and screws were used, 9 per cent more time was required than with the blade bit B with the self-centering attachment.

(4) The time required to run the screw down tight (¾ in.), and disengage the screwdriver from the screw, (use and disassemble), was at a minimum when the special bit A was used. With the blade bit B with the self-centering attachment, 2 per cent more time was required for use and disassemble; and with the ordinary blade bit C, 27 per cent more time was required than with the special bit A and screws.

Castable Refractory By Johns-Manville

As a result of recent development work on castable refractories, Johns-Manville announces a new light weight Firecrete for making special refractory shapes, for replacing difficult brick construction, for lining furnace doors, and for making small monolithic linings. The new product is suitable for working temperatures up to 2200 deg. F.

Sixty-five pounds of the material are required per cubic foot of finished construction. It can be used to form any required refractory shape. This is accomplished within a short period of time simply by mixing light weight Firecrete with water and casting it into a form. Twenty-four hours later the shape is ready to be placed in service.



KNOCKED-DOWN

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By H. W. PERRY

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ENTRANCE into the farm house and building construction field by the Tennessee Coal, Iron & Railroad Co., subsidiary of the United States Steel Corp., last autumn marked a notable forward step in the much-discussed problem of prefabricated low-cost housing. Of many plans and proposals advanced in recent years for providing sanitary, comfortable, durable yet inexpensive dwellings and other private structures, only two companies are known to the writer to now be offering and prepared to deliver prefabricated steel buildings to the general public. One of these companies (See the Iron Age, Dec. 15, 1938) makes factory assembled welded three, four and five-room dwellings, delivered complete with heating plant, plumbing, electric wiring and the usual modern household conveniences and fixtures. The other is the T. C. I. & R. Co., with its U.S.S. Panelbilt houses and farm buildings herein described and illustrated.

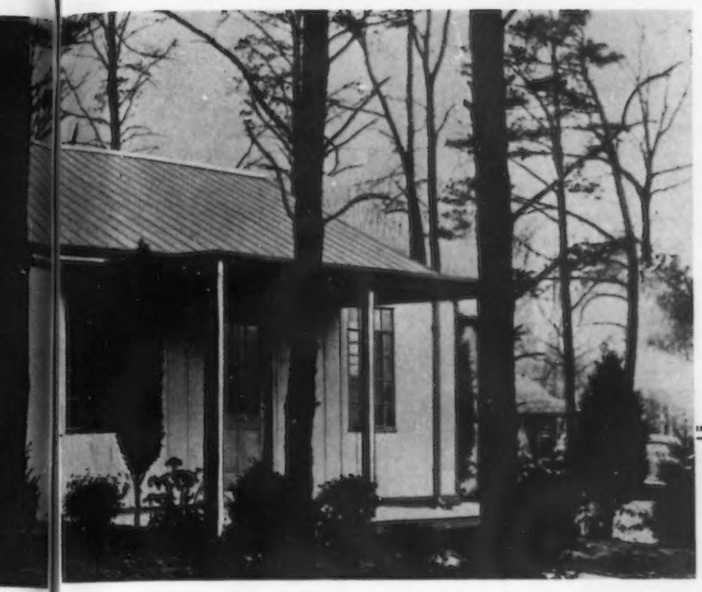
The manufacturing and construction method adopted by T.C.I. was developed by its engineers in cooperation with the construction division of the United States Farm Security Administration with the object of placing within the economic reach of farmers and others who need them large numbers of buildings of low first cost, long life and low maintenance cost. Steel was decided upon at the outset as the material best suited to rapid quantity production with a minimum of material waste and of labor expense for fabrication and erection. Plans and detail designs for the structures were then determined from consideration of long-distance shipping, ease of erection by unskilled labor available in rural areas, servicebility, security and appearance.

The result is building plans and a fabricating and erecting system that afford the purchaser a wide range of types and sizes of buildings easily and quickly erected of standardized beams, panels and other structural members produced in the factory and shipped knocked down in a relatively small number of units of a size and weight convenient for handling.

Months of research, designing and experimental work culminated in the shipment late last November of sections for the first of a dozen groups of buildings to go to as many farms in Alabama, Georgia and South Carodina under a contract with the Farm Security Administration. Each group is to consist of five buildings: a five-room dwelling, a barn, poultry house, outdoor storeroom and a sanitary outhouse. The dwellings contain a living room, combination kitchen-dining room, three bedrooms, two large closets and a pantry, and space for a bathroom if one is desired. Approximately 6 tons of steel are used in the house, which measures 24 x 36 ft., and 6½ tons in the four other buildings, which are constructed entirely of steel.

Cost of construction is brought down by the designs and prefabricating method to a level that makes the steel structures competitive with buildings of other materials, and, because of their assured durability and low maintenance cost, they have an advantage as regards financing, which in some cases may extend over a period of 40 years. Other reasons for the use of steel are that it is readily formed to precise shape and size by machinery with low labor costs, is adaptable to manufacture in large sections so that the number of pieces to be handled in shipping and erecting at the building site is greatly reduced, eliminates waste of material, enables rapid erection of preformed sections by unskilled labor, is proof against fire, lightning, wind, rodents and vermin, is unaffected by temperature and humidity changes, and is easy to keep clean and sanitary.

All structural parts are formed in the factory. Foundation piers are formed of hot-rolled steel channel sections shop-welded to a steel footing plate and coated with asphalt by a hot-dipping process. Steel joists to support a wood floor in the dwelling are cut to size. Siding, roof and ceiling panels are of box-rib type of standard dimensions, chiefly 4 ft. wide by 6, 8 or 12 ft. long. The panel frames are of cold-formed strip, primed and coated for protection against corrosion, and the outside



DWELLING house erected from standard U. S. Steel Corp. Panelbilt plans. The size is 24x36 ft., and the house contains a living room, three bedrooms, combination kitchen and dining room, and front and back porches. Steel joists support a wooden floor, and glass windows are fitted in steel casements with screens attached.

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STEEL HOUSE . . .

covering is of galvanized sheet steel specially coated for weather protection. All parts of the frame panels with their covering are welded together in precision jigs, producing strong, rigid panels having no visible nail or bolt heads and no holes punched in the exterior surfaces.

To provide for circulation in the air spaces of the house walls, 1 x 2-in. slotted holes are punched in the horizontal frame members of the panels. Hot air in summer rises through these to space under the gable roof and makes its exit through continuous ventilators in the ridge and through louvers in the gable ends. Overlapping crimps or grooves in the sheet metal render the buildings weather-tight. A steel fireplace having a jacket enclosure and an air-circulating means provides a central heating system for economically supplying warm air throughout the house in cold weather.

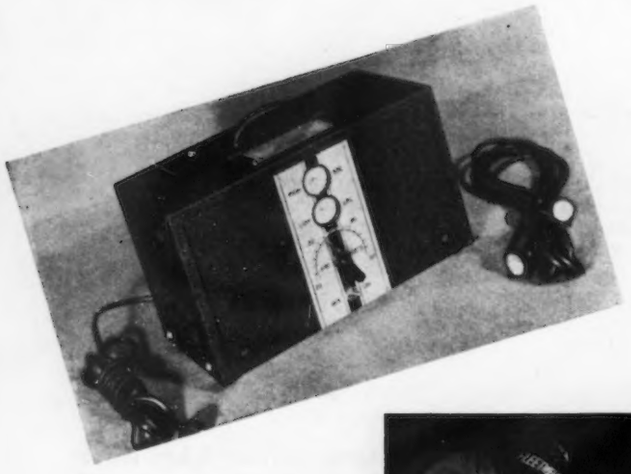
All of the structural parts are shipped knocked down but ready for assembling with a few ordinary hand tools. A farmer or other purchaser, aided by several helpers, can erect the buildings quickly and properly by following erection drawings furnished with each building. Joists, panels and other parts are bolted together, using angle plates at corners. The dwelling calls for the laying of a wood floor and for interior finish with insulating wallboard. The wallboard on side walls, partitions and ceilings, together with the wall ventilating system, is said to reduce the heat conductivity of the structure to a lower value than that of a 13-in. brick wall, thus rendering the house relatively cool in hot weather and conserving artificial heat in cold weather. Window and door casements are formed from sheet steel, and rain gutter and leader sections are provided. Single or double-flue steel chimneys are offered and are well ventilated and fire safe. No wet materials are used in their installation.

The barn and other outbuildings are of the same construction but lack the wood floor, wallboard finish and glazed windows. Standard dimensions are: barn, 18 x 28 ft. or 20 x 32 ft.; poultry house, 10 x 12 ft. with upper half of the front a screened opening; storehouse, 8 x 12 ft. with 3½-ft. overhang shelter on one side; and privy, 4 x 4 ft. on a concrete slab. The smaller barn has a one-cow stall, poultry room, rodent-proof corncrib, center wagon shed and a hay loft in each end. The larger one contains two-mule and two-cow stalls, wagon shed, large rodent-proof and ventilated storage room with a steel floor, and a hay loft over the entire area of the building with a loading door at each end.

This Panelbilt system of construction lends itself well to a diversity of structures of different dimensions and, by varied metal treatment, to attractive architectural effects. With only slight changes, the structural members can be used for garages, tourist cabins, service stations, roadside stands, small offices, industrial buildings and so on. As wall panels are in 4-ft. widths, dimensions of the structures can be in multiples of 4 ft. If desired, the owner of a house can add a room 8 x 12, 12 x 12 or 12 x 16 ft. Several types and sizes of porches which are available can be attached to the basic structure, as can also neatly designed steel blinds, door canopy and awnings.

Buildings erected by this system can be dismantled, moved and re-erected at small cost and with virtually 100 per cent salvage of material. The houses are well lighted by about a dozen large glazed windows and the barns by ample openings closed by hinged metal doors.

With first cost of the buildings already on a competitive level with structures made of lumber or other materials, the final cost to the buyer will be considerably lower when spread over the expected long life of the buildings. Long-term financing, low upkeep cost and lack of need for fire, wind, flood, lightning or earthquake insurance should result in the lowest-cost housing yet made available. If demand develops commensurate with the obvious advantages, large-scale production of prefabricated standardized structural members may be expected eventually to reduce the initial cost below that of frame construction.



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ARC welding operators are informed of over- or undervoltage conditions at the arc by light signals in this A. O. Smith Arc-Length Monitor.

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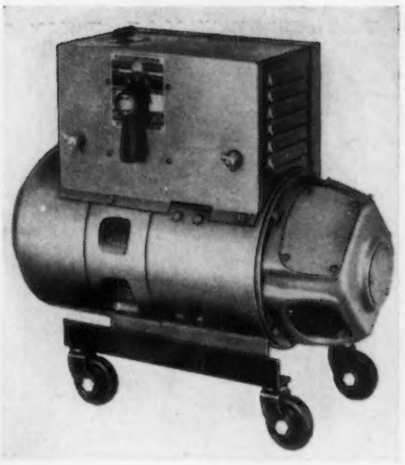

ABOVE

WILSON 150-amp. d.c. arc welder set has a range of adjustments from 20 to 200 amp. at 25 volts.

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AT RIGHT

PROPER relation of voltage and amperage for arc welding various materials are found on the job selector (voltage control) and current control of the new Lincoln Shield-Arc welders, available in standard ratings.

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. . . More Precise Control Assured

PARTICULARLY in arc welding apparatus of both the motor-generator and the transformer types, refinements in control design have been introduced so that the exact volt-amperage relationship can be selected to suit varied work requirements. A distinct advance is a warning device that tells the operator when the voltage at the arc (or arc length) deviates from the preselected norm. Other developments in equipment for the welding shop include a large conduit welder, spot welding machines and electronic tube controllers for them, new gas and gasoline torches for soldering and brazing, and a number of safety devices for protecting the welder. Because of its kinship to the resistance welder, a resistance type heater for forging blanks is also described in this review of recent equipment announcements.

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CONTROL over voltage is no definite assurance of a good arc weld, nevertheless lack of such control results in a poor quality of weld. To eliminate this variable due to the human element, the research division of the *A. O. Smith Corp.*, Milwaukee, has developed the Arc Length Monitor. With this device, the welder is informed of the length of his arc by means of two tiny bulbs, mounted inside his welding helmet, one on each side of the window through which he observes the arc.

Both bulbs are normally dark at the selected voltage. The one to the right glows faintly and with increased intensity as the voltage increases from that selected; the one to the left responds similarly as the voltage decreases. Maximum brilliance is kept well below the point of hurting the operator's eyes or interfering with his work. The instrument itself, which contains signal lights similar to those in the welder's helmet, is placed where it can be observed by the welding supervisor.

The Monitor is particularly applicable to the welding of light gage materials, especially stainless steel, requiring close control of the arc. Training time for new operators is also said to be reduced to about one-third the usual time through the use of this instrument.

Arc Welders

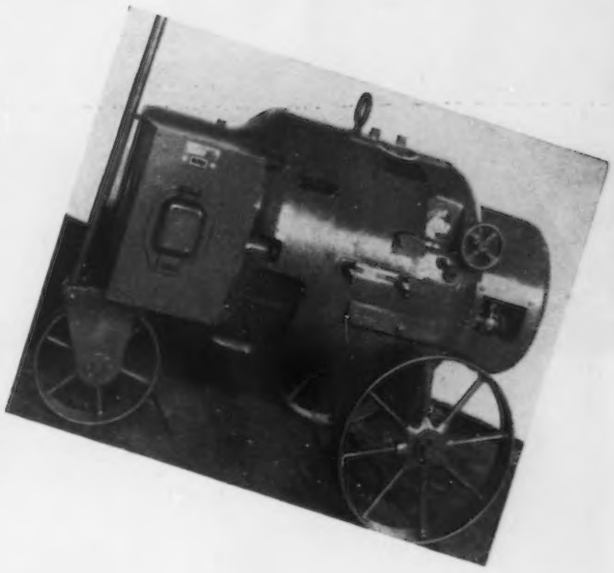
SELF-INDICATING job selector and current control calibrated and equipped with dials that indicate the

ABOVE

MAXIMUM welding current of 180 amp. is available in this 150-amp. a.c. transformer type welder recently announced by Westinghouse. It is designed for 440-220-volt, 60-cycle, single-phase circuits. Electrode diameter range is 1/16 to 3/16 in.

AT RIGHT

A BUILT-IN Arc Watchman insures constant current, regardless of voltage fluctuations, in this new 300-amp. Westinghouse motor-generator set type welder. An improved method of polarity reversal is said to prevent accidental reversal, and current does not change when machine heats up. Accuracy and speed in overhead welding is claimed for this unit.



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ANOTHER recent development of the Wilson Welder & Metals Co., Inc., New York, is this 100-amp. a.c. transformer type arc welder for light sheet metal welding and other light work requiring low current and fine control, using heavy coated electrodes such as Wilson No. 520. It will handle diameters up to 5/32 in. Adjustment of output from 25 to 150 amp. is made by the crank at top in infinite steps, the adjustment being read on the calibrated scale in front. Standard wiring is for single-phase, 220-volt, 60-cycle supply. Open circuit voltage is 65 volts. This compact unit is 24 in. high and 16½ in. in diameter.

By Latest Welding Apparatus . . .

By FRANK J. OLIVER
Associate Editor, The Iron Age

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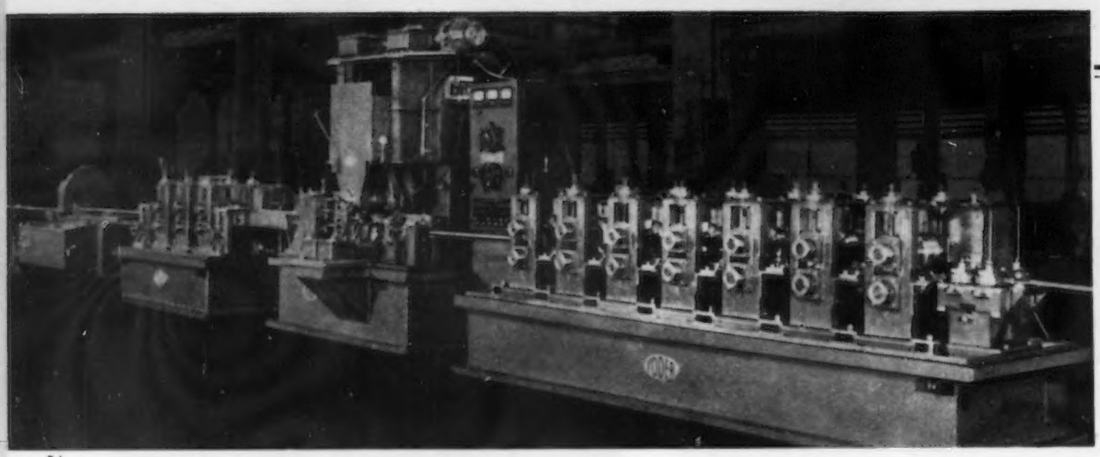
type of work and the required current for each setting are found in a new line of Shield-Arc welders, announced by the *Lincoln Electric Co.,* Cleveland. It is claimed that this development enables the operator to secure high quality welds at high speed since he can vary both the slope of the volt-ampere curve and the amount of welding current independently to suit each job. Both the voltage control (job selector) and current control are continuous in operation, that is they can be advanced or retarded in fine increments instead of in steps.

Separate excitation of the welding generator provides the latter with a constant source of field voltage independent of conditions at the welding arc, thus aiding in the maintenance of a steady arc with minimum of spatter. A laminated magnetic circuit is employed, having minimum reluctance to the flow of magnetic flux. This new line is available in all standard ratings in a.c. and d.c. motor driven types, belted or coupled types, and in gasoline and diesel engine driven types.

PARTICULAR attention has also been paid to current control in a new 150-amp. d.c. arc welding generator set just announced by *Wilson Welder & Metals Co., Inc.,* New York. Amperage is controlled by means of a three point current switch, with dial rheostat for fine adjustment. It is stated that the smoothness and precision of this control makes it possible to get the right current and enhances the adaptability of the unit to all types of electrodes, from bare to heavily coated. Open circuit voltage is from 40 to 75 volts. The set will use electrodes up to 3/16 in. diameter. Standard wiring is for 220 or 440-volt, three-phase, 60-cycle power supply. This machine is supplied in a portable model with rubber tired casters and in a stationary model.

Tube Forming and Welding Unit

SEVERAL new features are embodied in a continuous tube forming, welding, sizing and straightening, and cutting off machine recently shipped to a British company by the *Yoder Co.,* Cleveland. Micrometer adjustments are provided on the forming mill as well as on the sizing and straightening mill. Constant meshing gears are placed between top and bottom



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YODER continuous tube forming machine for making welded conduit from flat strip. Stock enters at right and is cut off at the far end. This unit, which was recently shipped to West Bromwich, England, is 85 ft. long and 5½ ft. in width. The welder (center) has motorized vertical electrode adjustment. Much of the structure is welded.

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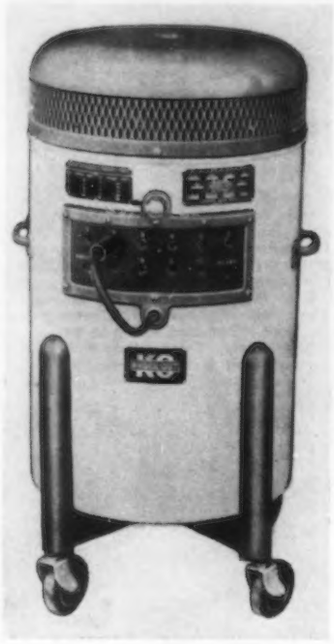
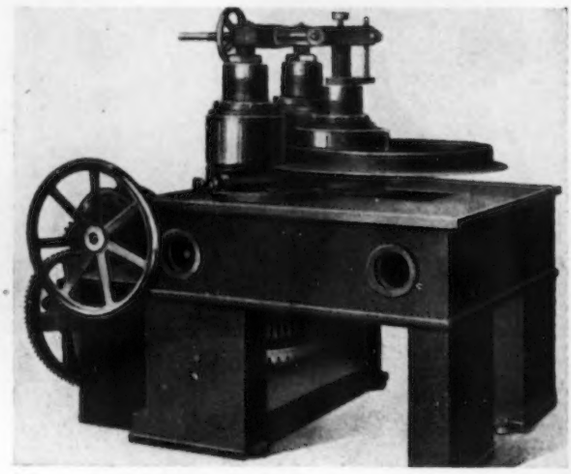


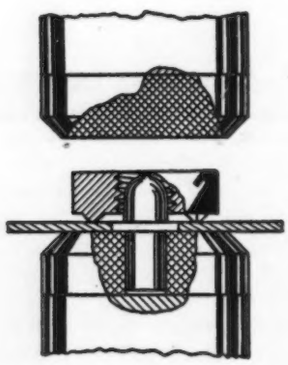
TEN heat taps are provided on this transformer type a.c. arc welder, made by K. O. Lee & Son Co., Aberdeen, S. D. Transformer is bolted to the framework and the entire unit is mounted on rubber casters. Available in three sizes.

AT RIGHT

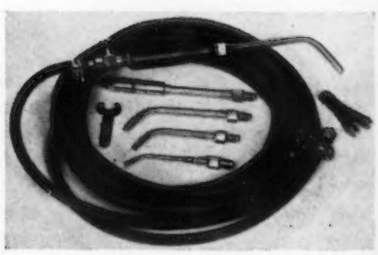
OF interest to welders is this horizontal type Hercules motor driven bending machine for cold rolling of angles, tees, beams, channels, flats, rounds or squares in circles or arcs. No change of rolls is required for different sections. Guide rolls are adjusted radially and vertically to compensate for any twisting action. All high speed gears are made of cut steel and the shafts are mounted in ball bearings where necessary. Made in five sizes, with driving motors from 10 to 50 hp. Marketed in the United States by G.D.S. Machinery & Supply Co., 101 Walker Street, New York.



EISLER bench type electric spot welder shown in the plunger press model. These small machines are useful in the manufacture of small parts and fine metal goods, including silver and other precious metals. The weight of the 1-kva. size is about 45 lb.



FOLLOWING the introduction of welding bolts in 1933, the Ohio Nut & Bolt Co., Berea, Ohio, has developed a series of square nuts for fastening by resistance welding. Four projection welding points are formed on each nut, so spaced as to obviate any difficulty in setting up the necessary electrodes on the welding machine or from molten metal splashing into the threads. Using standard 60-cycle current, the time of welding is generally only two or three cycles. Welding nuts are furnished in seven sizes ranging from ⅜ to 11/16 in. across the flats. The pilot shown in the lower electrode may be of steel and is set in fiber or bakelite insulation.



ABOVE

DEVELOPED primarily for automobile body work, this Prest-O-Lite air-acetylene soldering outfit includes four stems for fine, light, medium and heavy soldering, and for brazing and heating. There is also included an enclosed flame soldering copper for work in confined spaces. The outfit may be used with Prest-O-Lite small tanks if a regulator is employed. Supplied by Linde Air Products Co., unit of Union Carbide & Carbon Corp., New York.

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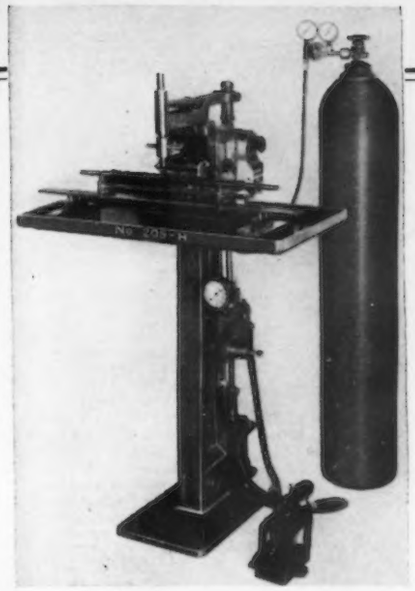
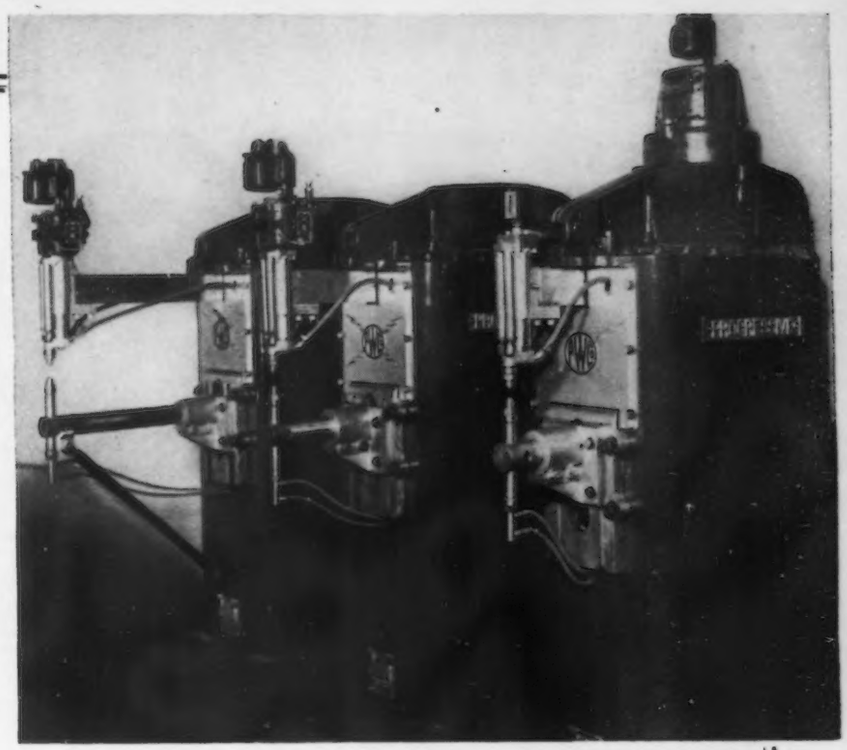
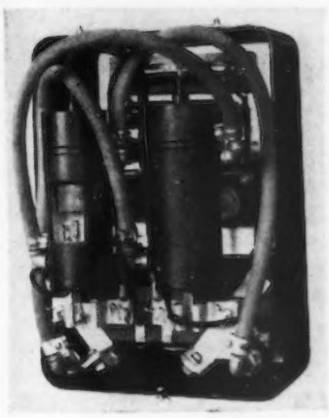


PREVENTION of oxidization, discoloration and brittleness when spot welding molybdenum and nickel wires to other metals is assured by directing hydrogen gas on the spot during the welding part of the cycle. The gas is cut off immediately after the weld is completed. This particular machine, made by the Eisler Engineering Co., Inc., Newark, N. J., is an air-operated vertical plunger type, rated at 5 kva. capacity. Other sizes are made up to 250-kva. rating.

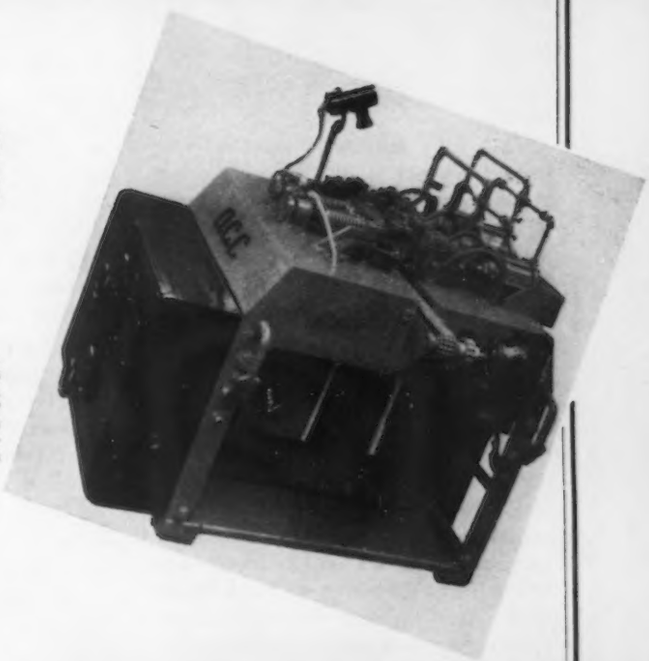


ABOVE

NEW Progressive multi-duty spot welders, showing the direct acting, air operated gun types at left and center, and the air-hydraulic booster design, right, for heavier welding pressures up to 3000 and 4000 lb. at the tips.



GENERAL ELECTRIC ignitron contactors for spot, projection and flash welders are now available, with or without enclosing cases, in 150, 300, 900 and 2500-amp. ratings, based on typical welding cycles.



AT RIGHT

ONE of five of the No. 5 L.S. a.c.f. Berwick electric resistance forging heaters recently installed in the Port Huron, Mich., plant of Pressed Metals of America for heating cross bars for controlling knee-action springs on General Motors cars. A photo-electric cell controls the temperature to which the bar is heated.

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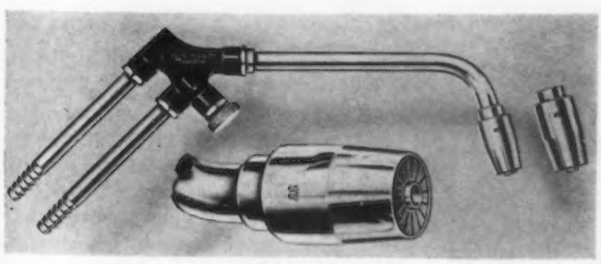

ABOVE

S. S. WHITE No. 8 blowpipe with radial grid tips for use with manufactured or natural gases.

AT RIGHT

UNDERSIDE of a 25-ton trolley crane made up of 173 pieces welded together. Span is 90 ft. This product of the Cleveland Crane & Engineering Co. is to be installed in the Clairton, Pa., plant of Carnegie-Illinois Steel Corp.

BAUMGARTH No. 300 pumpless blow torch may be tilted to any angle within limits of the spherical base design. It delivers a 6-in. blast or a fine pointed blue flame.

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FOR welders who must wear prescription glasses and require protection to the lenses and the eyes, the No. 225 lift-front, fit-over goggle is offered by Sellstrom Mfg. Co., 615 N. Aberdeen Street, Chicago. The frame is of a light weight material attached to the headband by double hinges that permit the goggles to be pushed forward and up. The headband is attached to the fabric cap, allowing loose adjustment for comfort and eliminating pressure headaches.

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A SPECIAL rheostat has been designed by the Ohmite Mfg. Co., Chicago, to control the heat of soldering pots and soldering irons. It is available in six ratings for irons of 40 to 500 watts and will give approximately 50 to 60 per cent wattage reduction. Supplied with dial and knob and either mounted or unmounted for panel installation. The use of this control is said to prevent overheating, lessens burnouts and increases life of the soldering iron.

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spindles. Wider use is made of welded steel construction in the new machine for greater strength with less weight but with approximately the same amount of machining being performed.

This fully automatic machine will form and weld ½-in. to 3-in. conduit at the rate of 80 to 50 ft. per min. All controls for the mill are centralized at the welder. One 40 to 50-hp. d.c. variable speed motor drives the entire mill.

The Yoder patented sizing and straightening mill has three sizing passes, making three slight reductions in the diameter of the pipe while the flexing passes perform the straightening action. The cut-off is the automatic flying saw type with saw motor and drive all mounted on the carriage, movable with the stock travel and driven from the sizing mill. A worm shaft runs through the seven-stand forming machine and through the sizing and straightening mill. Reduction units are provided in each stand of the forming mill.

Multi-Duty Spot Welder

SOLID welding arms adjustable to 36 in. throat are featured in the new line of multi-duty spot welders recently introduced by the *Progressive Welder Co.*, 737 Piquette Avenue, Detroit. The upper and lower arms can be moved out to the center of their 72-in. length. There are no flexible electrical buss connections. Welding pressure is applied directly by one of three means: direct air cylinder, with maximum pressure up to 1800 lb.; air-hydraulic booster, or fully hydraulic head for multiple spot or projection welding. Pressure unit is placed on the end of the welding arm, and an off-center mounting is used so that the cocking effect under load holds the piston tightly against the cylinder wall, thus assuring full current transmission. Dissimilar metals are used for gun piston and cylinder.

Water circulates through the center of the piston and through the welding tip. Overflow tubes seen through an inspection door in the front panel of the machine give positive assurance of water circulation through the tips and the transformer secondary. A single model will accommodate transformers from 75 to 150 kva. capacity. Transformer is removable on slides. All controls are locked in the machine, and the timing controls provide almost any combination for simple spot, interrupted or repeating welds.

Bench Type Spot Welder

TWO new models of bench type spot welders have been brought out by the *Eisler Engineering Co., Inc.*, 750 South 13th Street, Newark, N. J. They range in size from ¼ to 3 kva. The plunger press type is illustrated. There is also a conventional swinging arm type. Both types are arranged for 110 or 220 volts and are made for 25, 40, 50 or 60-cycle, single-phase circuits. Heat requirements for different gages are regulated through five secondary taps. If the machines are mounted on the bench, a chain is extended to the floor for treadle operation. Individual stands can also be supplied.

Resistance Forging Heater

PHOTOELECTRIC cell control of the temperature is featured in the new type L a.c.f. Berwick electric resistance heaters for forging work, offered by the *American Car & Foundry Co.*, 30 Church Street, New York, and described here because of their relationship to resistance welding equipment. Heating by the resistance method reduces the tendency to scale and thereby gives the forging a better appearance, besides reducing die wear on upsetting machines. The core heats first, eliminating the possibility of broken dies from hard cores. Some alloy steels can be heated to 2200 or 2300 deg. F. by this method. An electric eye is placed over each electrode and prevents both overheating or underheating. The photo cell controls the opening of the electrodes to remove the heated piece, closing on the cold piece being performed manually through a push button. It is also possible to have a fully automatic movement of the jaws, in which design the jaws remain open 1½ sec. for removal of a hot piece and insertion of a cold one.

On the manually operated heaters, the electrode can be spaced to heat any length of rod end, from 1 to 24 in. Twelve heat speeds are provided to give a range of heating for various diameters and lengths. A camshaft or air cylinder controls the opening of the electrodes, no adjustment being necessary for different diameters. On the type LA heaters, stock feed hoppers are provided to hold stock from 4 to 24 in. in length, and the hot piece

A GAUNTLET design with a one-piece back extending from the wearer's knuckles to the edge of the gauntlet in order to eliminate seams is found in the No. 13115 chrome-tanned leather glove, offered by Industrial Gloves Co., 734 Garfield Boulevard, Danville, Ill., for use by welding operators. Heavy cotton fleece lines the entire back of the glove, but no lining is used in the palm so as to assure proper "touch." Thumb seam is protected with an extra leather strap.

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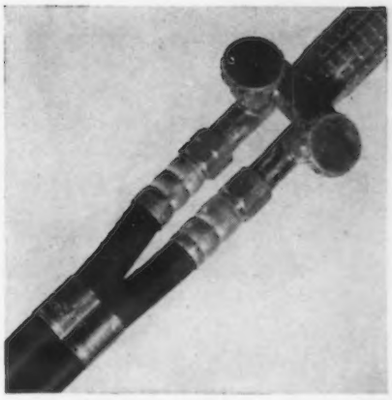

ABOVE

PATENTS have recently been granted the Hewitt Rubber Corp., Buffalo, for the design and method of manufacture of its Twin-weld welding hose for oxygen and acetylene. The individual passages have an interlining of non-blooming, gas-resisting compound, which is cord reinforced. The carcass is made to resist pressures many times those normally encountered in service. The hose is installed by splitting it with a knife along the joint line a sufficient distance to form a convenient Y at both tank and torch ends. The ferrules are then crimped to prevent further separation.

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AT RIGHT

THE metal shield fitted with a window of shatterproof glass for observation of the work eliminates the danger of flying sparks in spot welding operations at the new Ternstedt Trenton Division plant of General Motors. The operation shown is that of fusing two pieces to form the bolt of a Fisher Body door lock. A small slot beneath the glass permits insertion of the work pieces.

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is automatically discharged onto an inclined roller chute, carrying the piece hot end first to the operator at the upsetting machine.

Two sizes of fully automatic, type LA heaters are made: No. 3 has a rod range from ¼ to 1 in. diameter; No. 4, from ⅝ to 1¼ in. A No. 5 size is built as a manually fed heater only to heat stock from ⅞ up to 2 or 2½ in. in diameter with any length of heat from 4 up to 24 in. Type LS two-electrode forging heater has a diameter range from 1½ to 2½ in. and from 6 to 24 in. of heating length. A typical application of the No. 5 LS five-electrode heater is illustrated.

Spot and Flash Welding Contactors

ABSENCE of moving parts and quiet operation even when handling heavy amperages are featured in the new line of *General Electric* ignitron contactors for spot, projection and flash welders, especially for high speed applications such as found in automobile body work. The contactor consists of two water-cooled, sealed-off ignitron tubes so connected as to conduct the full-wave a.c. current to the welding machine when the control automobile body work. The contactor switch is closed. Current flow ceases when the control switch is opened. Any type of timer may be used. A new G-E flow switch, of the differential-pressure type assures adequate water cooling when the control is in operation, and this water may be passed to the welding machine, simplifying the cooling set-up.

Soldering and Brazing Blowpipe

THE *S. S. White Dental Mfg. Co.*, Industrial Division, 10 East 40th Street, New York, is marketing a high intensity gas and air torch for general purpose soldering and brazing. Three carburetors are regularly supplied with this No. 8 blowpipe: No. 1 for manufactured or coal gas; No. 2 for natural gas or petroleum gases like butane and propane, and No. 3 for mixtures of these gases. Carburetors are designed so that any increase of the flow of air at the bench connection is automatically accompanied by an increase in the flow of gas from the main line, thus maintaining the proper air-fuel ratio at all times.

Two tips are available. The smaller is suitable for all ordinary work and its flame can be held to a fine needle point or increased to a strong blast. The larger tip is for use where large quantities of alloys must be rapidly melted. Through a radial grid construction, two concentric cones are produced, a strong inner flame and a distinct outer flame that acts as a pilot light. It is said to produce a reducing flame that keeps the metal free of oxides. The outfit may be used in the hand or mounted permanently on a bench in any position.

Small Gasoline Blow Torches

SEVERAL new sizes of pumpless, safety blow torches are being marketed by *Baumgarth Mfg. Co.*, 836 Hubbard Street, Chicago. The No. 200 torch has a fuel capacity of 1 pint but is said to do the work of two quart torches. It delivers a large flame at a temperature of 2400 deg. F. or a small blue pointed flame as desired. Wind guard and soldering hook are provided. No. 300 torch, illustrated, with its spherical seat is suited for bench use. The No. 100 torch has a capacity of 2 oz. and a burning time of 1 hr. Maximum flame length is 6 in.; temperature, 2400 deg. Nozzle is of a special alloy and a wind guard is also furnished with this small model. Tanks are all made of seamless brass. Naphtha should be used as a fuel for Nos. 100 and 300 models.

THIS WEEK ON THE ASSEMBLY LINE

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By W. F. SHERMAN
Detroit Editor

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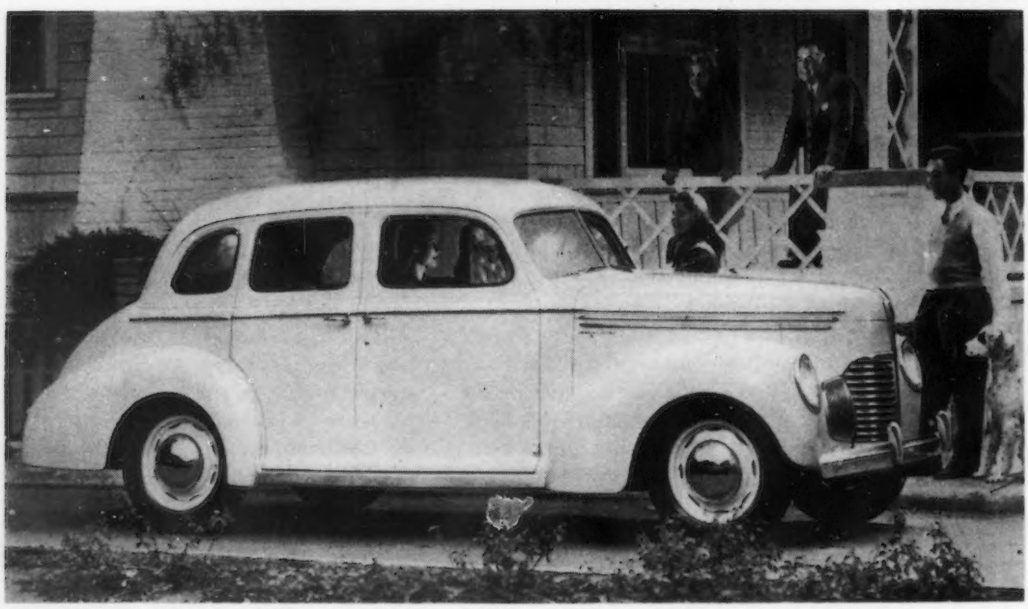
. . . Ford returns to five-day week, increasing output to record total for 1939 models . . . Sizable inventories of steel reported still on hand in two plants . . . New Studebaker to reach public on Saturday . . . Design work continuing on Packard light car.

DETROIT—Return of Ford Motor Co. to a five-day working week and indications that several other plants will go on similar schedules during this week are regarded here as presaging a production rise to a level between 95,000 and 100,000. The Ford output for the week, incidentally, reached a high point of 21,750 Fords and Mercurys, compared with 17,500 a week ago; the previous top was 21,400 the week before Christmas. Lincoln-Zephyr output rebounded from 450 units to 600. Meanwhile, Chevrolet maintained an output of 21,000 and Plymouth again turned out 9880 vehicles. This brought the week's total up to 89,400, compared with 86,725 the previous week and 56,900 a year ago, according to Ward's Automotive Reports. A forced decrease in Buick's assembly, due to a lack of bodies, caused by a brief strike at the Buick Fisher Body plant, prevented a better showing for the week.

While most other plants continued on a four-day schedule, being closed Friday, shipments of new cars were made on Friday and Saturday. By one source it was said that this had depleted banks of finished cars to almost nothing by Monday morning, putting numerous plants in a good position to go ahead with five-day production this week.

The past week brought forth a new estimate of the probable production of 1939 (calendar year) cars, trucks, buses, etc. A steel company analyst has put down the figure 3,750,000. Basis for the estimate is the expressed opinion of experienced observers and the automobile companies.

Attention continues to be centered on prospects of automobile steel buying—but no big orders have been brought into focus yet. In fact, during the past week two important independent consumers have expressed the belief that they would not purchase again for 1939 models. Briggs Mfg. Co. is said to have enough steel on hand or on order to care for Plymouth requirements, unless spring demand should prove to be unusually heavy. Packard seems definitely out of the market for this season. Of course, an upward revision of schedules beyond present expectations would alter this. It is difficult to obtain the true picture of the inventories in each plant but from a general survey it seems certain that steel buying during the



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THE four door sedan model of the new Studebaker Champion which takes the road on April 1. The car is about 1½ in. lower than most competitive cars, accentuating the length somewhat.

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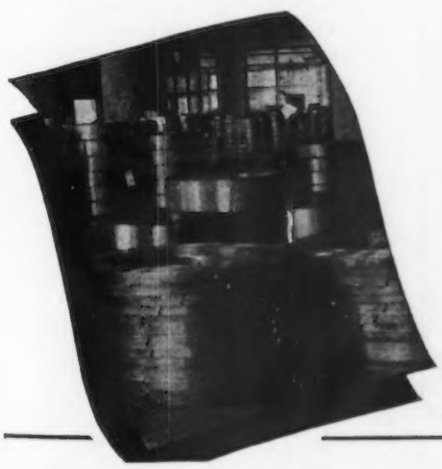
Ample warehouse stocks insure prompt deliveries . . . Write the Steel Sales Department for a list of sizes . . . or a quotation.



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early part of the second quarter will be desultory. A quickening in May probably will come as need for fill-in orders becomes more apparent and as requirements for 1940 models are made known.

Studebaker Champion Unveiled

Two days from now the new Studebaker Champion will be unveiled to the public. Details of the design have appeared from time to time in the Assembly Line but full specifications and prices have been kept confidential until now. According to Studebaker announcement, the car will appear in two models—a custom (standard) and deluxe with three body types available. The coupes will be priced at $660 and $720, two-door sedans at $700 and $760, four-door sedans at $740 and $800. The prices include Federal tax and handling charge for delivery at South Bend. The prices put the new Studebaker right in the middle of the Big Three.

Complete specifications reveal that the car is powered by a six cylinder engine, developing 78 hp. (SAE 21.6) with bore and stroke 3 in. x 3⅞ in. This gives a displacement of 164.3 cu. in. Compression ratio is 6.5 to 1. The car has the same over-all length as others in its price class, scaling 185⅝ in., with a 110 in. wheelbase. Shipping weight of the four-door sedan is only 2375 lb. This should bring the curb weight up to 2500 lb. as previously estimated.

The car has the appearance of the Studebaker Commander, with die cast radiator grilles and headlamps in the fenders. There is no running board. Door hinges are all concealed except one at the bottom of the front door, and the body is a welded all-steel assembly coated with sound deadening and insulating materials where required. It is the only car in the price field which offers over-drive and free wheeling ($45 extra) and also offers the Studebaker hill-holder device and the climatizer. Front end suspension makes use of single transverse leaf spring, but the suspension system is Studebaker's planar type which gives independent motion to each of the front wheels. One of the minor innovations in design which comes to our attention is a unique method of locking the wristpin in the connecting rod. The lock screw is tapered to serve as a wedge against the pin. Pistons are lynite furnished by the Aluminum Co. of America.

Because of its extremely low weight the power available is expected to give the car an outstanding performance. Added to this is the report that road tests show gasoline economy of about 25 per cent.

Packard's Plans Uncertain

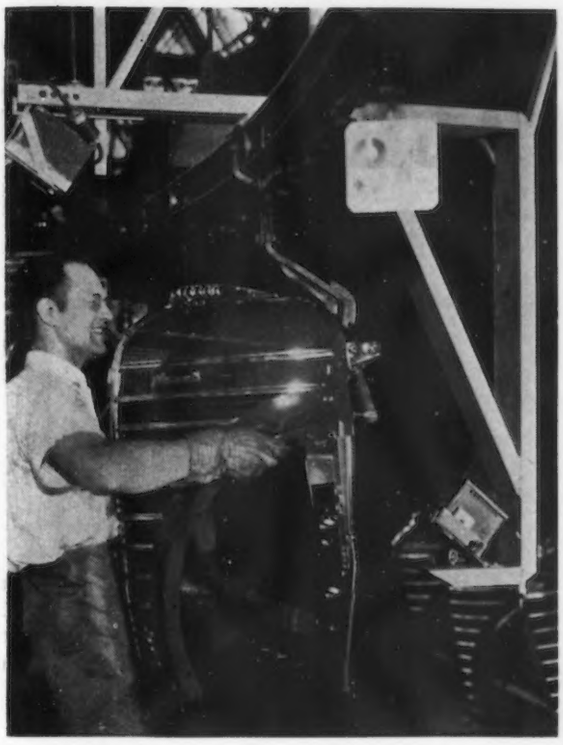
Packard, as reported a few weeks ago, ordered a stop in production preparations which were being made for its new light Six. For several weeks no outsider has been able to put a finger on the exact cause of the delay. In fact, no one has been able to say with authority whether it is a delay or an outright cancellation. Many stories have floated around Detroit, some rumored that the cost of production looked too high and that field tests with samples had failed to meet expectations. Another, more widely-reported story, had it that Packard is interested in aircraft engine work which would tie up building facilities previously slated for use in producing the new car. There might be a bit of truth in this story because the Packard plant is already utilized to the "nth" degree. It is said to have the greatest productivity per square foot of any plant in the industry.

Among suppliers, however, it is quite generally believed that appearance of the car has been merely delayed. It seems that even when some parts were released for tooling, drawings were not 100 per cent complete. As work progressed, engineers determined that they would not be able to keep up the pace they had set for themselves so outside work was cancelled until the engineers could put more of the finishing touches on their handiwork. Further evidence that the car will make an appearance (probably next year) is seen in the fact that the engineering department is continuing development work.

Packard's interest in aircraft diesel engines is reported to have been revived, with an attempt to produce a large power plant of this type supposedly in the offing. The company's prominent role in the work on Liberty aircraft engines has strengthened the supposition that activity of this sort will be found in the plant if development work is successful on the diesel.

From other directions there have come rumors of plants cutting production of their usual product and concentrating on aircraft or munitions

THE BULL OF THE WOODS — BY J. R. WILLIAMS



AT LEFT

THE conveyor dips to work level and waits with a subassembly until the worker removes these parts for the Plymouth final assembly line. When a new Plymouth chassis reaches this station, the worker finds a radiator, grille and front end assembly of the proper color waiting beside him on this automatic feeder line. A beam of light from the box over his head strikes the electric eye at the lower right and starts the conveyor again when the part has been removed. Similar electric eye apparatus now assists the worker at more than a dozen points on Plymouth assembly lines.

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BELOW

LAMP checking fixtures, running on overhead tracks, are provided at the end of the Dodge assembly line. The adjustment of head lamps is one of the final steps before the car's engine is started and the new vehicle is driven out for shipment. The fixture swings into place ahead of the car with rubber pads making uniform contact with the front end. As the car moves over the conveyor, it pushes the fixture ahead without changing its position relative to the car. Each headlight beam passes through a condensing lens and is thrown on a green glass screen marked with crossing vertical and horizontal lines on which the beam is centered.

work, one generally circulated story having said that this was the reason that no basic changes would be made in next year's automobile models. In most cases, the teller of the tale overlooks the fact that designs of 1940 models were made some time ago without fanfare and with conventional reasons to back up the decisions.

More Labor Troubles

A labor dispute in the Fisher Body plant No. 1 at Flint, which started nearly two weeks ago resulted in two brief shutdowns at the plant and threw 7000 men out of work at Fisher Body and Buick last week. A dispute in the trim department at Fisher Body, in which the union charged that the company was speeding up production, led to a lay-off of six men and their replacement, followed by a strike. The plant shutdowns were temporary, ending after company officials conferred with representatives of Homer Martin's union and the CIO union.

Another brief strike involving UAW members took place late in the week at Kelsey-Hayes Wheel Co. because CIO-UAW workers charged a general foreman with "continued provocation." Neither strike could be attributed definitely to inter-union warfare and in each case union officials denied that their sectional disputes played a part in the shutdowns.

In response to a request from R. J. Thomas, president of the CIO-supported union, Herman L. Weckler, vice-president of Chrysler Corp., agreed to extend the existing union agreement at Chrysler until the end of April. He also notified unionists that during the time of their sectional dispute, the corporation would not deal with one faction without representatives of other factions being present.

Track Shipments Rise 46 Per Cent in February

SHIPMENTS of trackwork for T-rail track weighing 60 lb. per yard and heavier amounted to 4250 net tons in February, as compared with 2909 tons in January and 3014 tons in February, 1938, according to the American Iron and Steel Institute. The February shipments represented a gain of 46 per cent over the preceding month and were the highest of any month since March, 1938. Shipments in the first two months of the present year total 7159 tons against 6149 in the corresponding period of 1938.

THIS WEEK IN WASHINGTON

. . . Roosevelt disowns move for economy . . . Spending spree likely to continue until public intervenes . . . Military Affairs Committee urges $100,000,000 be spent for strategic materials . . . Congress approves $358,000,000 national defense program.

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By L. W. MOFFETT
Washington Editor, The Iron Age

o o o

WASHINGTON—Buck passing between the White House and the Capitol on tax revision as necessary to business recovery has developed serious doubt that the present session of Congress will do anything about it, except in one important respect. There is good prospect that social security payroll taxes for old age insurance will be modified with an estimated savings to employers and employees in excess of $200,000,000 in the next two years. The unexpected suggestion of Secretary Morgenthau before the House Ways and Means Committee to eliminate "avoidable burden on American productive enterprise" by limiting the old age reserve fund had White House approval and since sentiment in Congress is favorable this tapering of social security taxes is expected to get statutory sanction.

A contrary situation prevails with regard to anything like early broad economy-tax revision program. Hopes for slashes in business taxes, to fit in with a recovery program, had been raised several weeks ago by moves in this direction by high Administration officials, starting with Mr. Morgenthau and Under Secretary of the Treasury Hanes and followed by Secretary of Commerce Hopkins in his Des Moines, Iowa, speech. While these expressions, indicating that reform had been laid aside in favor of recovery, had been considerably discounted in some quarters, they were generally accepted as reflecting a shift by the Administration to a more conservative policy. It was widely believed that the Administration was prepared to line up with the more conservative element of Democrats in Congress, who, in response to growing public complaint about unchecked spending and taxation, long have been pushing for a downward revision of levies on business.

Wires Found Crossed

It turned out that the wires were crossed in Administration circles. For the President dashed the idea that he was taking the initial move in the way of tax reform. Instead he has stuck by his message to Congress in January in which he gave no promise of tax revision, though stating there would be no increases, unless agricultural parity payments were boosted, as the House has now proposed. The President warned that if these payments were increased it would be necessary to levy taxes to meet them. At the same time he made it clear there was going to be no let-up in spending.

The moves of the Treasury and Mr. Hopkins toward "business appeasement" did not have White House approval and are said to have brought vigorous protests by the more radical inside Administration group which is said to have felt particularly resentful toward Mr. Hopkins. They seemed to consider that, inasmuch as he is extremely close to the White House, he had betrayed them in their insistence for further reform. Whether or not these protests had anything to do with it is not known, but the President abruptly dashed the idea that he was going to lead a move for tax revision. He appeared to be piqued by the suggestion. With a show of some heat he inferred that the move was motivated by a desire to avoid taxes and to cut down Government revenue. As if tossing responsibility to Congressional advocates of economy who had hoped he would start the drive for tax reduction, the President said that real economies must come out of relief, public works and social security and slum clearance, "all of those being predicated on the guess of many well meaning people that thereby, taking away employment from several million workers, business will automatically pick up and employ the entire slack plus the other large number of people who are out of work but not in any way being helped by the Government. If there were some guarantee that this would happen, it would be worth considering."

Spending Spree to Continue

How the President thought there could be a "guarantee" he did not indicate. Rather he rejected the idea of cutting down Government expenditures. The hope was that he would recur to his campaign warning that, if bankruptcy is to be avoided there must be a halt on them, and give preference to tax relief that might well inspire business confidence, increase

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PETROLEUM PRODUCTS FOR ALL INDUSTRIES

employment and slash Government costs.

So the idea of Government economy has been thrown out of the window and the spending spree is to proceed unabated unless rising public sentiment turns the tide and supports the move being made in Congress to slash taxes and Government costs. The move is being made by such Democratic Senators as Harrison of Mississippi, chairman of the Finance Committee, and Byrd of Virginia, also a member of that committee. With others, these Senators constitute a conservative group who long ago sharply split with the President over his tax and spending program. Reports have it that, despite the rebuff it has received, the Treasury Department also is working on a revision program. But important, if any, tax changes at the present session of Congress are held to be improbable, as much as some members of Congress desire it, having in mind the political campaign of next year.

That so-called economy-minded members of Congress do not let consistency annoy them, however, is made clear by the vote of the House Committee on Appropriations last week when it reported out an all-time high farm bill carrying $1,067,274,427, or $244,593,376 above the Budget Bureau estimates. Of the sum $265,000,000 is proposed for parity and conservation payments. Reports are common in Washington that these huge payments were voted in return for the full $150,000,000 WPA fund asked for by the Administration. It was once cut by Congress but the President has renewed his request for the entire amount. Really economy-minded members of Congress are fighting both items.

Economy Side Losing

Present indications are that they are fighting a losing battle. For while many of their colleagues are quick to criticise the Administration for its vast spending, they themselves are only too willing to shun economy on issues which are local. This is shown in strong support begin given to the jacked-up parity payments, with the obvious appeal to the farm vote. Just at present it looks as though the boost will be approved. If so it will reveal that the Administration adopted clever strategy in challenging Congress to accept responsibility for slashing expenditures. This was done through Chairman Marriner Eccles of the Federal Reserve Board, the Administration's outstanding advocate of the Administration's spending-lending policies. Eccles appeared before the special silver Senate committee and virtually defied Congress to vote budget-balancing economies. Eccles again said he was convinced that a policy of retrenchment under present conditions would have "disastrous results" but declared that we live under a democracy, and that the views of the majority "should promptly be made effective."

One Tax May Be Cut

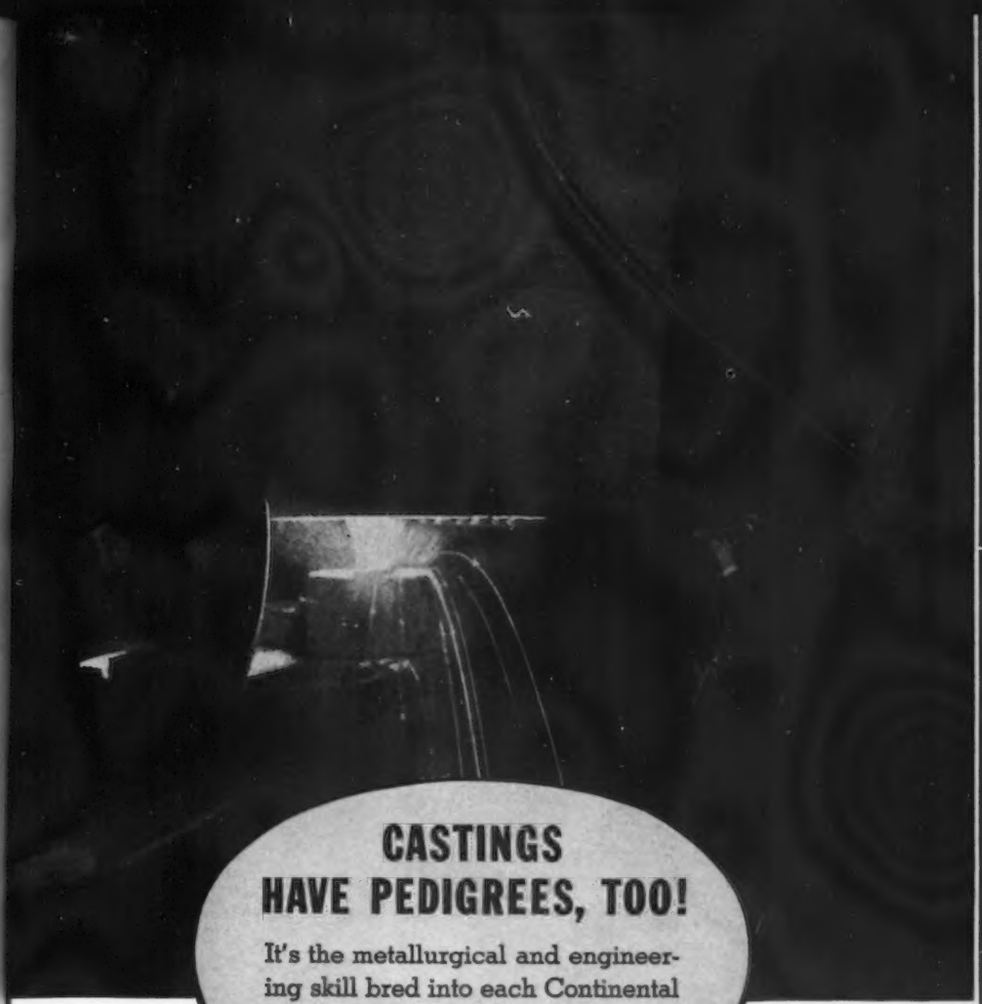
Specifically President Roosevelt and Secretary of the Treasury Morgenthau gave encouragement to business by announcing that the Administration is studying the possibility of partially abandoning the reserve system under the social security program and that the tax for the next few years may be reduced below the rate anticipated when the act was passed in 1935.

The existing law imposes a 1 per cent payroll tax on employers through 1939; a 1½ per cent tax beginning in 1940 through 1942; a 2 per cent tax from 1943 to 1945; a 2½ per cent tax from 1946 to 1948; and a 3 per cent tax in 1949 and thereafter. Mr. Morgenthau advanced three plans for paring these taxes through 1942, one of which would continue the present 1 per cent rate, but he declined to indicate any preference. He merely said his department would have no objection to a reduction. Any change would, of course, require Congressional action.

No 40-Billion Reserve

At the same time, Mr. Roosevelt confirmed at a press conference that a change in the social security reserve provision is under consideration and said that a reserve of from $25,000,000,000 to $30,000,000,000 might prove to be adequate to take care of old-age payments over a three to five-year period; that the existing reserve provision of the law has been properly criticised; and that the Government does not intend to build up a $40,000,000,000 reserve, as has been suggested from time to time.

The Treasury Secretary, who would remove some of the stigma attached to the term social security taxes by renaming them "contributions" told



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Industry has learned to recognize the advantages of steel castings by Continental. Leadership in this important field has been achieved by advanced methods that keep Continental a step ahead of changing demands. Simple designs or intricate, a few ounces or 130 tons—Continental man-power and modern equipment are flexibly geared to meet your requirements on any kind of alloy and carbon steel castings. From start to finish, the entire Continental organization combines its skill and experience to produce the finest steel castings to your specifications. Four strategically located plants, each with complete planning departments, cooperate for maximum economy. Thorough cleaning methods and rigid inspection are other key factors. Add to these, Continental's vast production capacity and strict adherence to delivery schedules and you can see why Continental is "First for Steel Castings."

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Here are striking examples of Continental leadership in the general machinery field. Castings like these require the utmost in metallurgical and engineering proficiency. Every unit reflects the sincere interest and unusual lengths to which the Continental organization goes to meet your specific needs.

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Manufacturers of Rolling Mill Equipment, including Steel and Alloy Steel Castings, Iron and Alloy Iron Rolls, Steel and Alloy Steel Rolls

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Continental Direct Fired Annealing Furnaces
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the committee that if existing rates are continued without making the upward adjustments provided by the act it would be necessary at some future date to hike the rates above those now specified in the law. Otherwise, he explained, "there will be a deficiency which the Government will have to make up from other tax sources."

U. S. Offers Prefabricated Building Material Data

WASHINGTON — Information on the performance of prefabricated building materials is available as a result of testing experiments recently completed by the National Bureau of Standards, Department of Commerce. Analyses of these studies may be obtained from the Superintendent of Documents, Washington. Three reports (10c. each) include results of tests on frameless steel, beam steel floors and "fabrihome" constructions for walls and partitions. A fourth pamphlet (15c.) deals with Steelox, a prefabricated construction material for walls, partitions, floors and roofs.

Congress Approves $358,000,000 National Defense Program

WASHINGTON — Congress last week passed the $358,000,000 national defense program and took initial steps to provide the necessary funds for setting the program into motion.

The conference report on the defense bill, which passed both Houses in short order, authorized $300,000,000 for the Air Corps to build up its fighting strength of 6000 planes; $23,750,000 for strengthening the Panama Canal defenses; and $34,500,000 for educational orders to be placed over the four-year period ending in June, 1941. A provision which would have exempted manufacturers from the labor standards prescribed under the Walsh-Healey Public Contracts Act was eliminated several weeks ago by the Senate Military Affairs Committee.

Stricken from the measure by the Senate and House conferees was the provision which would have required War and Navy Departments to withhold contracts from firms found guilty of violating the Wagner Act. The provision had been described in some quarters as an Administration move to appease John L. Lewis for his acceptance of the President's peace conference proposal.

The House also passed without opposition a $116,539,387 deficiency appropriation as part of the $185,000,000 deficiency bill and would provide funds for so-called "critical items" which include semi-automatic rifles, light and heavy artillery tanks, anti-aircraft guns, gas masks and similar equipment needed by the Army.

The deficiency bill also provides $36,700,637 for continuing the naval shipbuilding program and other miscellaneous naval functions and $3,000,000 for aircraft research.

Both Houses have yet to take action on a regular Army supply bill which, among other things, carries a $50,000,000 appropriation for beginning construction on 565 aircraft as the first phase of the aircraft building program.

Government Steel Orders $556,262

WASHINGTON — Government purchases of iron and steel products, as reported by the Labor Department's Public Contracts Division for the week ended March 18, totaled $556,262.44, while contracts for machinery amounted to $513,252.84. Details of these and related awards follow:

Iron and Steel Products

Lakeside Bridge & Steel Co., Milwaukee, slides and base rings	$64,968.00
Edward Katzinger Co., Chicago, kitchen utensils	10,659.74
Dahlstrom Metallic Door Co., Jamestown, N. Y., metal work	12,632.00
The Central Foundry Co., Bessemer, Ala., iron pipe	14,604.24
Carnegie-Illinois Steel Corp., Pittsburgh, Pa., steel plates	350,000.00
Raisler Corp., New York City, boilers and oil burners	12,266.00
Schmitt Steel Co., Portland, Ore., stop-log guides	17,928.00
Messinger Bearings, Inc., Philadelphia, roller paths	40,040.00
Hunsicker Engineering Co., Lebanon, Pa., buoy shackles and swivels	14,495.26
American Rolling Mill Co., Middletown, Ohio, pier noses	18,669.20

Non-Ferrous Metals and Alloys

Aluminum Company of America, aluminum, alloy	*$168,350.72
Pollak Mfg. Co., Arlington, N. J., aluminum cartridge containers	188,669.60
Aluminum Co. of America, Pittsburgh, aluminum rods, bars, sheets and tubing	110,866.24

*Estimated.

(Continued on Page 56)


DEPENDABILITY
PHILO
BRAND
QUALITY • SERVICE
Ohio Ferro-Alloys Corporation
Canton, Ohio

(Continued from Page 54)

Bridgeport Brass Co., Bridgeport, Conn., brass bar	21,435.53
Illinois Zinc Co., New York City, Peru, Ill., zinc	40,532.84
I. S. Turover, Bethesda, Md., copper-nickel alloy	Indefinite
Machinery	
Star Machinery Co., Seattle, Wash., boring machine	$20,667.50
Marshall & Huschart Machinery Co., Chicago, boring mill	19,700.00
Kearney & Trecker Corp., Milwaukee, Wis., milling machine	30,602.00
Consolidated Machine Tool Corp., Rochester, N. Y., scarfing machine	14,950.00
Kingsbury Machine Tool Corp., Keene, N. H., milling and drilling machines	22,350.74
Kearney & Trecker Corp., Milwaukee, milling machines	15,809.60
Tidewater Supply Co., Inc., Norfolk, Va., drilling and tapping machine	14,090.00
Landis Tool Co., Waynesboro, Pa., hydraulic grinder	20,382.00
The Huber Mfg. Co., Marion, Ohio, road rollers	19,920.00
Dalrymple Equipment Co., Amory, Miss., tractors, bulldozers	13,100.00
Riblet Tramway Co., Spokane, Wash., tramway	22,940.00
Barber Greene Co., Aurora, Ill., conveyors	11,509.00
B. F. Sturtevant Co., Boston, main blowers	287,232.00

Chile Diverts Steel Purchases from U. S.

WASHINGON—The Commerce Department reports that demand in Chile for iron and steel products, principally black sheets to be galvanized for roofing, and skelp for the manufacture of pipe has increased sharply since the earthquake in January.

The United States whose products are favored because of quality and prompt delivery would normally supply the bulk of such demand, but due to the recent acute shortage of dollar exchange, the Exchange Control Commission has found it necessary to curtail imports of even essential commodities from the United States, thus diverting purchases to countries which have exchange available.

It is reported that 1400 tons of corrugated galvanized sheets have been purchased from Argentina with money donated by that country to the earthquake relief funds. Two local galvanizing plants, one in Santiago and one in Valparaiso, are reported to have arranged to obtain 4000 tons of black sheets from Belgium in return for a barter of barley.

$100,000,000 Sought for Strategic Materials

WASHINGTON — The House Military Affairs Committee has recommended passage of a bill authorizing $100,000,000 to be spent over a four-year period for the purchase and storage of strategic and critical materials.

Suggesting that the material purchased be of a standard grade to which industry is accustomed, the committee voted to encourage the development of domestic sources of manganese. With modern equipment and machinery now available from many sources and with trial orders sufficient to give encouragement to further development the domestic sources, particularly manganese, "could be developed to such an extent that within a four or five-year period we would probably be independent of foreign sources for supplies," the committee said.

Specifically, the committee recommended a stock pile of 554,000 gross tons of manganese ore; 250,000 gross tons of chrome ore; 3350 tons of tungsten ore: and 85,000 tons of tin.

Flood Control for Steel Centers Sought

WASHINGTON—A House appropriations sub-committee was told last week that steel centers should be protected from floods because of the major role the industry will play in the national defense program. Lawrence W. Campbell, of Johnstown, Pa., a member of the United States Flood Control Federation, urged the committee to approve an expenditure of $195,000,000 for flood control projects for the fiscal year beginning next July 1.

ICC Urges $300,000,000 Loans to Railroads

WASHINGTON—The Interstate Commerce Commission recommended to Congress last week that the RFC be authorized to loan the railroads $300,000,000 for equipment purchases and that land grant rates, which the agency said cost the railroads from $7,000,000 to $10,000,000 annually, be discontinued.

Weir Urges U. S. to Halt Export of Steel Scrap

PITTSBURGH—Pointing out that in his opinion no one in this country has any idea of the extent of scrap reserves, E. T. Weir, board chairman, National Steel Corp., last week declared that America should halt the exporting of steel scrap until reserves of this basic raw material have been built up to meet any emergency.

Mr. Weir said that under existing conditions he didn't think Germany or any other European nation would permit the export of one pound of steel scrap, "yet we have been sending it abroad by hundreds of shiploads."

Although the National Steel head does not feel America is threatened by war, he recalled that after this country entered the World War a shortage of scrap seriously handicapped the industry.

Granite City Steel Reports First Loss

GRANITE CITY STEEL CO. for 1938 reported the first loss since its organization in 1927, according to the pamphlet report released last week. A deficit of $330,231 was incurred as compared with net income in 1937 of $245,225. 1938 sales declined to $6,359,472 from $13,234,442 in the previous year.

Steel Cartel Authorizes Price Cutting

LONDON—The Coordinating Committee of the International Steel Export Association has authorized the central selling offices to reduce prices whenever necessary to meet competition. According to the Cologne *Gazette*, this decision will lead to a more elastic price policy, as the sales organizations will henceforth be in a position to meet price cutting in certain important export markets.

Belgian steelworks' representatives recently informed their principals that it was virtually impossible in many overseas markets to sell at the official prices quoted by the Steel Cartel.

It will be recalled that at the recent Dusseldorf meeting of the European Tube Cartel members affirmed their determination to maintain present quotations.

Standard Steel Spring Sees Operating Upswing

PITTSBURGH — Standard Steel Spring Co. reports net profit of $86,046, equal to 41c. per share on common stock for 1938, compared with net profit of $362,685, equal to $1.82 per share in 1937. R. C. Enos, president, stated plant operations during 1938 averaged 44 per cent of capacity but it is expected a rate from 60 to 65 per cent will be maintained for the first six months of 1939.

World Tin Plate Output 270,000 Tons in January

WORLD production of tin plate in January rose to 270,000 tons from 250,000 tons in December, according to the International Tin Research and Development Council. In January, 1938, output was 241,000 tons. World consumption of tin in January was unchanged from the previous month at 11,300 tons, while world production increased to 15,900 tons from 9300 tons in December.

New Armature Design Reduces Slotting Die Costs

DISCOVERY of a new principle in armature winding which, it is said, will save electrical manufacturers hundreds of thousands of dollars a year, has been announced by two members of the staff of the School of Electrical Engineering at Cornell University, Prof. M. G. Malti and Dr. Fritz Herzog, research associate. Their discovery will be described in a paper to be presented at the national convention of the American Institute of Electrical Engineers in June.

Professor Malti explained that in the past manufacturers of electric motors and generators have had to make a different die for cutting slots in the armature of each separate type of machine, because the winding of armatures has followed a set formula, which, it was believed, could not be varied. By the new principles discovered at Cornell, the old method of winding armatures has been so revised that the same slot die may be used for numerous different types of machines. Thus the cost of each die is distributed over several machines, resulting in considerable savings. The design is said to represent an outstanding advance in working out the general solution for fractional-slot and dead-coil windings.

Republic Lifts Stainless Capacity at Massillon

CLEVELAND—Stainless steel capacity of Republic Steel Corp. at Massillon, Ohio, will be increased, while cold rolled carbon steel strip capacity at Warren will be expanded. In both plants new equipment will be installed and present equipment rearranged. Work on the improvements will be started immediately.

Stainless capacity, with the exception of the hot rolling operations, will be concentrated in Massillon, the hot rolling to be continued in Warren. Three annealing and pickling lines are being moved from Warren to Massillon and three new reversing mills, a 34-in. 4-high, a 28-in. 4-high, and a 20-in. 4-high, together with a 2-high skin pass mill are to be installed at Massillon.

The cold rolled carbon strip capacity at Warren will be substantially increased due to the removal of stainless cold rolling to Massillon. In addition to new equipment at Massillon it will be necessary to rebuild a part of the present structures.

"Rush, Please," and Maurath Order Speeds to Arabia

CLEVELAND—Just 55 minutes before a cargo vessel was scheduled to sail from a Brooklyn pier to Arabia, a truck carrying 3500 lb. of welding rods rumbled alongside, ending a race which followed a "Rush, Please" order cabled from a European customer to Maurath, Inc., of Cleveland.

The order was received by George A. Maurath on a recent Tuesday. Immediately the Maurath plant at 7309 Union Avenue, Cleveland, went on a "wartime basis" and the full order was completed by Friday noon. The race by truck followed, and the vessel, the welding rods in its hold, sailed on Saturday.

Farmers' Position Best in 8 Years, A. S. & W. Finds

CLEVELAND—The agricultural industry is now in better potential position than it has been for possibly the last eight years, according to the agricultural extension department of the American Steel & Wire Co., Cleveland, in its first crop report for this year.

"Large supplies of feed crops are available and record stocks of grain are still on the farms," said Frank J. Reynolds, manager of the department, who pointed out that of course the large supplies of cotton, wheat, corn, dairy and poultry products can prove a boomerang if industrial income does not improve rapidly enough to consume them at fair prices to the farmers.

"Government reports and statistical forecasts indicate that industrial income should improve during 1939," said Mr. Reynolds.

"The Agricultural Adjustment Administration's loan and benefit payment programs are continuing to be large factors in the farmer's income," he said.

Center of U. S. Strip Capacity Still in Ohio

THE geographical center of capacity for producing hot-rolled sheet and strip steel in the United States has moved only a few miles since 1926 despite the fact that total capacity for making those products has been about doubled since that year as a result of the development of continuous mills.

At the end of 1938, the center of sheet and strip capacity, as calculated by the American Iron and Steel Institute, was located in Richland County, Ohio, near the town of Shelby. That center was only about 25 miles west and north of what was the center in 1926, a point in Wayne County, Ohio, near Wooster.

An earlier calculation by the Institute placed the center of sheet steel consumption in Paulding County in northwestern Ohio, and the center of strip steel consumption a few miles from Toledo, Ohio.

Sheet & Tube Seamless Mill Display Wins Award

CLEVELAND — First honor among national exhibitors at the Midwest Purchasing Agents' show here was awarded Youngstown Sheet & Tube Co. for its seamless tube mill display. Reliable Steel Plate Co., Cleveland, won a prize among the local exhibitors. Peninsular Steel Co., Cleveland, showed motion pictures of the manufacture of Swedish steel by Uddeholms.

Horsepower Ratings for Flat Leather Belting

THE engineering committee of the American Leather Belting Association has published a four-page circular entitled "Horsepower Ratings for Oak Tanned Flat Leather Belting." These ratings were officially adopted by the association on Dec. 7, 1938. The tables embraced in this circular include horsepower per inch of width, correction factor for center distance and small pulley diameter, service correction factors and thickness specifications. Typical illustrative examples are also given as to the use of this table. Copies of the horsepower rating tables as above can be secured from the American Leather Belting Association, 100 Gold Street, New York.

Colloidal Graphite Being Applied to Plastics

THE use of pure graphite to make plastics completely opaque has now been made possible through the development by Acheson Colloids Corp., Port Huron, Mich., of a new form of Dag colloidal graphite. In this new form, the graphite has such infinitesimal particle size that it will readily stay in suspension in many low viscosity, volatile fluids miscible with plastics.

Further uses of the new product in the plastic field may also lie in the direction of providing dry lubrication where, for various reasons, oil should not be used.

Standard Data Method of Timestudy Described in New Book

SINCE 91 per cent of the manufacturing plants in the United States employ fewer than 500 employees apiece, the standard-data method of timestudy is the only one practical for the average business, according to "Timestudy for Cost Control," a new book by Phil Carroll recently published by McGraw-Hill, New York.

Any work that can be timestudied comes within the field of measurement by data, the author says in his explanation for laymen of the elements and procedures of the best timestudy methods. Standard timestudy data, including tables, charts and curves compiled from elements that form the basis for setting standards for an operation, can easily be secured. Efficient methods are the only ones a small manufacturer can consider, and it has been repeatedly demonstrated that the standard-data method meets that requirement.

The author, a well known authority in timestudy work, is vice-president of Dyer Engineers, industrial consultants.

Young Spring & Wire Expands at Chicago

CHICAGO—L. A. Young Spring & Wire Co. will transfer its complete mattress spring manufacturing facilities from Detroit to Chicago's Clearing industrial district by April 1. Construction is now under way on a one-story addition, 113 x 200 ft., to the company's present facilities here.

Follow Constitution's Ideals, Robertson Advises

CINCINNATI—Instead of acting as a citizen of the whole United States, nearly everyone is now thinking and acting as a member of a minority group, A. W. Robertson, board chairman, Westinghouse Electric & Mfg. Co. told Chamber of Commerce members here last week.

"As consumers," he said, "we believe in low prices, but as workers we believe even more strongly in higher wages which, of course, mean higher prices. If every person in the United States would read the Constitution carefully and rededicate himself to the ideals expressed there, the nation might be well on the way toward solution of its economic and social problems" he said.

Mesta Material Thrown Overboard in Storm

PITTSBURGH—When Mesta Machine Co.'s first boatload of continuous hot and cold mill equipment reached John Summers & Sons, Ltd., Shotten, Chester, Eng., it was minus about 130 tons of material, including two housings for an edging mill, which were thrown overboard.

After leaving Baltimore recently, the *Belnor,* the boat carrying the consignment, ran into severe storms about 700 miles from the Virginia coast, which resulted in several large castings shifting on the deck, thus causing a list in the ship, making it necessary to jettison the housings and other pieces of equipment. The missing material will be replaced and shipped at a later date as the Mesta company is to send two more consignments before the order is completed.

Mesta has built a complete continuous 60-in. hot and cold strip mill for the John Summers & Sons Co., and assembly at the latter's plant is now in progress.

Northwestern to Build $6,500,000 Technical School

CHICAGO — Northwestern University last week was given $6,500,000 by the Walter P. Murphy Foundation for the establishment of a technical institute on the campus at Evanston, Ill. Mr. Murphy is president of the Standard Railway Equipment Co., Chicago.

Work on the new structure will begin May 1, and completion is expected within five to six months. The four-story building will be of white stone in modern Gothic style and will cover an area 500 ft. x 250 ft.

Provision will be made for 800 students, with departments of civil, mechanical, electrical and chemical engineering. The university's physics and chemistry classes will be moved to the new building. Departments of metallurgy and aeronautics are planned. Chicago industries will cooperate in a system allowing students alternately to study and work in large plants.

Tool Electrification Forum Program Arranged

A NUMBER of papers by visiting representatives of the machine tool industry will feature the 1939 Machine Tool Electrification Forum, to be held April 18-20 at the East Pittsburgh works of the Westinghouse Electric & Mfg. Co.

Considerations in determining sizes and characteristics of motors for machine-tool service will be outlined by W. F. Ridgway, Ingersoll Milling Ma-

chine Co., and cost advantages and limitations of electric drives will be discussed by Robert S. Elberty, Landis Tool Co.

The first session, on the afternoon of April 18, will include a paper on the use of solenoids for auxiliary machine functions, and optional control equipment demonstrations. The next two sessions, on April 19, will cover use of gearmotors to simplify design problems, possibilities of streamlining for production machines, and a study of reversing motor duty. Also, clutch shifting motors and auxiliary devices, small motors in machine tool applications, electrical apparatus for forging and threading machines, and electrical equipment for boring mill drives.

The final technical session, April 20, will feature papers on arc welding in machine construction, tachometer generators and built-in instruments, inspection practices in electrical manufacturing, and machine tool requirements of the U. S. Navy development program. This will be followed, in the afternoon, by an open forum and a visit to the Westinghouse research laboratories and, in the evening, by the annual dinner.

New England Foundry Meeting on April 14-15

THE third regional foundry conference to be sponsored jointly by the New England Foundrymen's Association, the American Foundrymen's Association and the Massachusetts Institute of Technology will be held at the institute at Cambridge, Mass., on April 14 and 15.

The technical sessions on the first day will be devoted to personnel problems, spectroscopy as applied to the foundry and recent developments in high test cast irons. On the second day the sessions will cover blended sands, pressure bronze castings and core room operation.

The committee arranging the conference includes R. F. Harrington, Hunt-Spiller Mfg. Corp., chairman; Charles O. Butler, Warren Pipe Co. of Mass., Inc., vice-chairman; Le Roy M. Sherwin, Brown & Sharpe Mfg. Co.; D. L. Parker, General Electric Co.; A. S. Wright, Hunt-Spiller Mfg. Corp.; R. G. Elphinstone, Westinghouse Electric & Mfg. Co.; Louis G. Tarantino, secretary of Connecticut Non-Ferrous Foundrymen's Association; H. S. Washburn, Jr., secretary of Connecticut Foundrymen's Association; Robert J. Nelson, Arcade Malleable Iron Co., Inc., and president of New England Foundrymen's Association, and Professors J. M. Lessells and P. E. Kyle of the Massachusetts Institute of Technology.

ASA Issues Standards List

A LIST of some 400 nationally approved standards, safety codes, and specifications, indexed alphabetically and also industrially according to subject, has been issued by the American Standards Association, 29 West 39th Street, New York. These cover work in the fields of civil, mechanical and electrical engineering, automobile and aircraft, transportation, ferrous metallurgy, non-ferrous metallurgy, chemical industry, textiles, mining, wood, petroleum products, and symbols and abbreviations.

While not included in this index, copies of many foreign standards and specifications are available for sale or loan upon request.

Employment Depends On Machine Tools, W. E. Whipp Says

CLEVELAND—Unemployment is the result of a disturbed world and disordered economy, not of the machine, Wendell E. Whipp, president of the National Machine Tool Builders Association, said this week in an address before the Industrial Sales Conference of the American Gas Association.

"In our industry," he said, "there are only about 150 distinctive and important companies. Capital investment is comparatively small, amounting to only about $150,000,000. In the utility and manufacturing groups, there are many corporations, each of which has a larger capital investment than our entire industry; yet it is doubtful if any of these corporations could have attained their present magnitude or could continue to operate as at present without the machine tool.

"It is a further extraordinary fact that our industry employs only 40,000 to 50,000 men, whereas it is claimed that the automobile industry, in its diversified productive and service angles, gives employment to 5,000,000 people. And yet the automotive industry, as we know it today, would not exist but for the machine tool industry. It would employ but a relative handful of people, because, in place of the excellent car which you can now purchase for around $600 you would have available only a vastly inferior car, selling for $2,500 and upwards."

Bryant Finds Machine Tool Mortality Low

MORE than 40 dealers and direct sellers of machine tools in the metropolitan New York area met the first time at an informal dinner meeting at the Engineers' Club, New York, on Friday, March 24. The meeting was sponsored by the Associated Machine Tool Dealers of America through its New York regional chairman, John Cetrule, of the Triplex Machine Tool Corp. Principal speaker was A. G. Bryant, national president of the association and president of Bryant Machinery & Engineering Co., Chicago.

Pointing to the wide fluctuation in machine tool sales volume, Mr. Bryant indicated that in 1933, the dollar volume had shrunk to 1/20th of the 1929 volume, and in 1937 the volume was 25 times greater than in 1933. Dollar sales in 1938 were about one-third those of 1937. Yet, despite these wide swings, the mortality among manufacturers and the selling organizations has been very low because they are in a basic industry, Mr. Bryant said.

A 1939 Packard sells for one-third of its 1909 counterpart, and has immeasurably better performance, the speaker noted. He said a 5-ft. radial drill, on the other hand, sells for three and one-half times the price of the 5-ft. radial drill of 30 years ago ($5,400 vs. $1,600) and in the example of the lathe the price disparity for a machine of comparable capacity is even greater or six times. Although the productive capacity of the new machines has gone up in even greater proportion, the job of selling has not become easier, he said.

. . . OBITUARY . . .

WALTER H. NEUBERT, chief tool supervisor of the A. O. Smith Corp., Milwaukee, died on March 22, aged 52 years. He was one of the four original employees of the Smith firm when it started the manufacture of bicycles.

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EDWARD C. STRIFFLER, for the past 20 years president of the company of the same name and engaged in the wholesale steel and iron trade in New York, died at the Montclair (N. J.) Community Hospital after a long illness on March 20. He was 70 years old.

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ROWLAND S. LE BARRE of the Detroit office of Republic Steel Corp., died Sunday, March 26. Mr. Le Barre, who was born Dec. 30, 1877, in Ontario, joined the Illinois Steel Co. in the late nineties, went to New Orleans for that firm in 1902, was in the Cleveland office of Carnegie Steel Co. and Illinois Steel Co. from 1905 to 1908. In the latter year he became assistant manager of sales in the Cleveland office. In 1919 Mr. Le Barre became general manager of alloy steel sales for the old Interstate Iron & Steel Co. In 1924 he opened the Detroit office of Interstate and headed it until the company was taken over by Central Alloy and later by Republic Steel Corp. Since then, he had been in the Detroit sales office of Republic.

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CHARLES B. MURRAY, engineer, was killed by an automobile in Cleveland, March 25. After working for a number of steel companies as a chemist and metallurgist, he formed his own commercial laboratory in Pittsburgh in 1904 and later entered business in Cleveland.

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VIRGIL J. TIBBITTS, superintendent, Ohio Nut & Bolt Co., Berea, died suddenly on March 26, aged 33 years.

Perkins Steel Wage Order Again Enjoined

WASHINGTON — A temporary injunction restraining the Secretary of Labor from continuing in effect her minimum steel wage determination was granted on Monday by the United States Court of Appeals for the District of Columbia. Further argument on the merits of the case, which had been instituted by seven independent producers in the East, was scheduled for April 3.

Unlike the restraining order granted in Federal District Court several weeks ago under which three of the companies were permitted to bid on Navy contracts without adhering to the prescribed hourly minimum wage of 62½ cents, the order issued by the Court of Appeals in effect sets aside the entire steel wage determination, which divided the industry into six geographical divisions and fixed minimum rates ranging from 62½ cents in the East and in four Middle Western states down to 45 cents in the South. Hence, until further order of the court, all steel companies can bid on Government work without the necessity of complying with the steel wage order.

In a four to one decision with Justice Edgerton dissenting, the court handed down no opinion—just the terse statement that the petitioners had shown "sufficient cause" to entitle them to the relief asked for when they petitioned the court on March 17.

Steel Exports Hold Up During February

EXPORTS of iron and steel products, excluding scrap, from the United States in February declined only 11 tons from January to a total of 134,777 gross tons with a value of $9,772,707, according to preliminary figures of the Metals and Minerals Division of the Bureau of Foreign and Domestic Commerce. In February a year ago exports amounted to 203,850 tons valued at $12,643,356.

Meanwhile imports, excepting scrap, totaled only 17,736 tons valued at $1,236,677, compared with 24,331 tons valued at $1,729,145 in January. Of the February imports 2889 tons was ferromanganese from Norway and Czechoslovakia.

The Government's export figures for February included 20,324 tons of plates, 19,886 tons of black sheets, 10,968 tons of tin plate, while scrap exports were off 2971 tons from January to 227,884 tons, compared with 256,790 tons in February, 1938.

PWA Steel Purchases Now Total $591,002,980

WASHINGTON — Purchases of iron and steel for PWA projects now amount to $591,002,980 for the five-and-a-half-year period from June, 1933, to January, 1939, according to an analysis of material buying for PWA, made by the Bureau of Labor Statistics, Department of Labor. This figure is part of the $2,121,892,444 expended for industrial orders.

The bureau statement said that by far the largest items of iron and steel purchased for PWA projects were structural and reinforcing steel. A total of $217,479,574 was spent for these classes of steel, of which $18,734,497 has been spent on 1938 projects. For general rolling mill products not otherwise classified, a total of $110,464,355 was spent. The third largest purchase was heating and ventilating equipment, which amounted to $64,215,358.

A. E. Walker Vice President Of National Supply Co.

PITTSBURGH — A. E. Walker will become vice-president and a director of the National Supply Co., Pittsburgh, effective April 1. He has been executive vice-president of Pittsburgh Steel Co. since Jan. 1, 1937. Mr. Walker is well known throughout the steel industry, especially in connection with tubular goods sales. Before coming with Pittsburgh Steel Co. he was general manager of sales for Republic Steel Corp. at Cleveland and a major part of his steel sales experience was with the Republic company.

The National Supply Co., which is a large maker of oil country goods, has two automatic seamless tube mills as Ambridge, Pa., making tubes ranging from 1¼ in. to 14 in. in diameter, with an annual finishing capacity of 300,000 tons, while facilities at its Spang Works, Etna, Pa., include butt and lap weld equipment with annual finishing capacity of 100,000 tons of butt weld and 120,000 tons of lap weld pipe.

Taft-Peirce Mfg. Co., Woonsocket, R. I., and its Detroit representative, the John E. Livingstone Co., have moved back to their former Detroit address at 2921 East Grant Boulevard, where complete lines of Taft-Peirce gages, small tools and magnetic chucks are carried in stock.

. . . THE NEWS IN BRIEF . . .

Ford goes to five-day week, bringing output up to highest level thus far in 1939 . . . At least two automobile plants have sizable inventories of steel.—**Page 46.**

Trackwork shipments rise 46 per cent in February.—**Page 49.**

President Roosevelt disowns move for economy; spending spree likely to continue until public intervenes. —**Page 50.**

Government orders of steel for latest reported week total $556,262.—**Page 54.**

Congress approves $385,000,000 national defense program, expansion of air force to 6000 planes.—**Page 54.**

Bureau of Standards offers new information on performance of prefabricated building materials.—**Page 54.**

House Military Affairs Committee urges $100,000,000 be spent for wartime strategic materials.—**Page 56.**

Chile's shortage of dollar exchange forces diversion of steel orders from U. S.—**Page 56.**

Flood controls to protect steel centers in time of war are sought.—**Page 57.**

Granite City Steel Co. reports the first loss since its organization in 1927.—**Page 57.**

E. T. Weir says U. S. should halt exporting of scrap until emergency reserve has been built up.—**Page 57.**

ICC recommends Congress authorize RFC to lend $300,000,000 to railroads for equipment purchases.—**Page 57.**

World tin plate output 270,000 tons in January.—**Page 58.**

Standard Steel Spring Co. sees 60-65 per cent operating average in first half of 1939.—**Page 58.**

New armature design developed by Cornell University staff members reduces slotting die costs.—**Page 58.**

Republic Steel Corp. will lift stainless capacity at Massillon, Ohio, expand cold rolled strip capacity at Warren, Ohio.—**Page 58.**

Farmers are in best potential position in eight years, American Steel & Wire Co. says in crop report.—**Page 59.**

Geographical center of sheet and strip capacity moves only slightly in last 12 years.—**Page 59.**

Youngstown Sheet & Tube Co.'s seamless pipe mill display wins award at Cleveland.—**Page 59.**

Rush order for 3500 lb. of welding rods, destined for Arabia, makes ship side with 55 min. to spare. —**Page 59.**

Horsepower ratings for flat leather belting.—**Page 60.**

Colloidal graphite is applied to make plastics completely opaque, by Port Huron, Mich., company.—**Page 60.**

Standard data method of time study is described in new book by Phil Carroll, vice-president of Dyer Engineers.—**Page 60.**

L. A. Young Spring & Wire Co. to transfer mattress spring manufacturing facilities from Detroit to Chicago.—**Page 60.**

Storm forces ship's crew to jettison part of Mesta Machine Co.'s hot and cold mill shipment to English company.—**Page 61.**

Northwestern University is given $6,500,000 by Walter P. Murphy Foundation to establish technical institute.—**Page 61.**

Details of tool electrification forum program to be held April 18-20 at East Pittsburgh, Pa., are arranged.—**Page 61.**

Follow ideals of the Constitution, act as citizen of U. S., not member of various minorities, Westinghouse chairman urges.—**Page 61.**

American Standards Association issues standards list.—**Page 62.**

Third regional foundry conference will be held April 14-15 at the Massachusetts Institute of Technology, Cambridge, Mass.—**Page 62.**

Automobile plants could employ but a handful of men without the highly developed machine tool industry, W. E. Whipp says.—**Page 63.**

Secretary of Labor's minimum steel wage order is enjoined by U. S. Court of Appeals.—**Page 64.**

Steel exports from U. S. declined only 11 tons in February; scrap exports off 2971 tons.—**Page 65.**

PWA purchases of iron and steel for 5½ years total $591,002,980.—**Page 65.**

A. E. Walker becomes vice-president and a director of National Supply Co.—**Page 65.**

A. G. Bryant tells New York gathering that machine tool mortality is low because the industry is basic. —**Page 68.**

Thirty steel company executives in Pittsburgh area attend dinner sponsored by SWOC.—**Page 69.**

E. J. Kulas cites effects of high wages, low prices on Otis Steel Co.'s operating results for 1938.—**Page 69.**

SECTIONS INDEX

MEETINGS

April 17 and 18—American Zinc Institute and the Galvanizers Committee, St. Louis.

April 20 and 21—Concrete Reinforcing Steel Institute, Augusta, Ga.

April 26 to 29—Electrochemical Society, Columbus, Ohio.

May 15 to 18—American Foundrymen's Association, Cincinnati.

May 16 and 17—American Steel Warehouse Association, Chicago.

May 22 to June 8—Society of Automotive Engineers, world congress, in various cities.

May 24 and 25—National Metal Trades Association, Chicago.

May 25—American Iron and Steel Institute, New York.

*May 25 to June 1—Triple Convention (American Supply and Machinery Association, the National Supply and Machinery Distributers' Association and the Southern Supply and Machinery Distributers' Association), on board the S.S. Monarch of Bermuda.

Oct. 23 to 27—National Metal Congress, Chicago.

Pieces of Eighty

Excerpts from a Book about a History-making Invention

#46 A mechanically cleaned Cuno installed on the job (described in book) made an 18% reduction on rejections.

#59 A *continuously cleanable* Cuno, handling 86 gallons per minute of (described) fluid, was checked after 3 years in service and found perfect.

#60 The engineering department of one manufacturer reported their cost of (described) was reduced *seventy-five per cent* after their Cuno filter was installed.

#71 What did Cuno do for Colonel Lindbergh?

Read about these extraordinarily interesting cases in our new book. It'll open your eyes to the flaws in old fashioned stop and go straining . . . and show you how to save money to boot. Use the coupon below. The book's free.

ONE quick revolution cleans the Cuno Auto-Klean filter — without interrupting the flow. It's the Cuno principle of edge filtration, giving *continuous* protection.

There is no need for expensive duplex installations — nothing to do but install — and run.

Other Cuno *continuously cleanable* filters remove extremely fine particles and abrasive solids as small as .001". You name your conditions. We have the filter to fit them, even if they include air or gases. Get Cuno *continuous* savings.

Cuno Engineering Corporation
363 South Vine Street
Meriden, Connecticut
Please send me, free, "80 Ways to Make More Money."

Name.....

Company..... City..... State.....

Street.....

avoid stop and go with CUNO *Filters*

CUNO ENGINEERING CORPORATION ★ MERIDEN, CONNECTICUT

. . . CANADA . . .

. . . *Dominion mills largely engaged in export business.*

TORONTO, March 28—Steel interests still are looking forward to orders from the Canadian Pacific Railway, but so far no announcement has been forthcoming from this quarter, and no rail awards have been reported from either the C.P.R., or the C.N.R. Some buying is being done by the automotive industry and sales on this account are moving ahead steadily, while most other business is of a prospective nature. Export business is holding up and it is reported that Great Britain again is taking scheduled delivery on orders placed last year, accounting for about half of the production of some of the Canadian plants. The Canadian steel industry as a whole is maintaining an operating schedule of about 60 per cent.

Merchant pig iron sales are slow. However, local blast furnace representatives look for a speeding up in demand with the opening of Great Lakes navigation. Pig iron production in February dropped 21 per cent, to 41,333 gross tons against 57,660 tons in the previous month. No foundry iron was made in the month and only 401 tons of malleable, the balance being basic for further use of producing companies. One blast furnace was blown out, leaving only three stacks blowing out of 10 in Canada.

. GREAT BRITAIN .

. . . *Pig iron production gaining owing to scarcity of scrap.*

LONDON, March 28 (*By Cable*)—International political tension is hampering commercial demand for pig iron, but it is believed that this is only a temporary condition and pig iron production on the British Northeast coast is increasing rapidly, partly owing to the scarcity of scrap. It is generally expected that British rearmament will be accelerated involving still heavier Government demand for iron and steel.

Fresh buying of British semi-finished and finished steel is dull but most departments are still busy and output is increasing. Ship and rail specifications are scarce but billets and sheet bars are in request, and black and galvanized sheets, light sections and channels are in demand for air raid precautions.

British merchants' organizations are protesting strongly against attempts now being made by heavy steel makers to limit direct sales to distributing merchants.

Continental steel market is dull. Latest Central Europe developments are tending to restrain demand.

The South Africa Iron & Steel Corp. plans a new steel works at Vereeiniging as soon as the international situation clears.

British tin plate mills are working at 60 per cent of capacity, the maximum allowed without penalty. Unfilled orders are over 4,000,000 base boxes which is the highest figure since January, 1938. Home trade demand for tin plate is active, but only moderate export sales are being effected.

CAST IRON PIPE

Neenah, Wis., closes bids April 6 for 2160 ft. of 6-in. pipe for water system, including fittings, valves, etc.

Mount Hood Water District, Brightwood, Ore., plans pipe lines for water systems at Brightwood, Faubion and several other communities in that area. Cost about $125,000, of which $50,000 will be secured through bond issue and remainder through Federal aid.

South Coast County Water District, Laguna Beach, Cal., plans pipe lines for water system; also 500,000-gal. concrete reservoir. Cost about $78,000. Financing is being arranged through Federal aid.

Puyallup, Wash., plans about 5000 ft. of 14-in. for main water line from Salmon Creek dam and reservoir site to city. Entire project will cost about $39,100. Financing in part is being arranged through Federal aid.

Bremerton, Wash., plans about 15,000 ft. of 12-in. for main water line in West Bremerton district, in conjunction with new highway. Cost about $60,000. Work is scheduled to be carried out early in summer. C. C. Casad, City Hall, is city engineer.

Alexandria, Ky., plans pipe lines for water system and other waterworks installation. Cost about $113,000, of which $83,392 will be secured through Federal aid. R. C. Stout, Alexandria, is engineer.

Grandview, Tex., plans pipe line extensions in water system. Fund of about $30,000 will be arranged for this and other municipal improvements.

McKenney, Va., plans pipe line extensions in water system. Fund of about $71,000 is being arranged for this and sewage system, of which approximately $51,000 will be secured through Federal aid.

Municipal Water Board, Bourne, Mass., plans pipe line extensions in water system in Gray Gables, Monument Beach and Pocasset districts. Cost about $350,000 with other waterworks installation. Whitman & Howard, 89 Broad Street, Boston, are consulting engineers.

Abilene, Tex., plans pipe lines for main water supply from Fort Phantom Hill reservoir, including pumping station and other waterworks installation. Cost about $530,000.

Burbank, Cal., has awarded 140 tons of 6 and 8-in., class 250, pipe to United States Pipe & Foundry Co., San Francisco.

National Park Service, Box 755, Boulder City, Nev., asks bids March 31 on 370 tons of 6 and 8-in. pipe and fittings.

Oceanside, Cal., asks bids April 10 on 700 ft. of 12-in., 900 ft. of 14-in., 4900 ft. of 18-in., and 17,000 ft. of 14, 16 and 18-in. pipe, reinforced concrete cast iron, and transite alternates.

30 Steel Executives At SWOC Dinner

PITTSBURGH—About 30 steel executives from this district were guests of the Steel Workers' Organizing Committee at a dinner and meeting here last week when Mordecai Ezekiel, economic adviser to Secretary of Agriculture Wallace, led a discussion of his recent book titled, "Jobs For All Through Industrial Expansion."

The get-together meeting sponsored by steel union officials was closed to the public and the press but it has been learned that an extended discussion followed Mr. Ezekiel's talk. High points included the need for definite action to help eliminate abnormal unemployment, the position of industry with respect to this action, and also the pros and cons of Government participation.

It is understood that about 30 steel executives of the 42 invited attended the meeting which is the first of its kind to be held here. Observers here interpret this latest action by the SWOC as a step toward creating closer cooperation and understanding between the union and the employers.

Kulas Cites High Wages, Low Prices in 1938

CLEVELAND—The low sales volume during 1938, with greatly reduced steel prices and the high standard of wages, had a drastic effect upon operating results, stockholders of Otis Steel Co., Cleveland, are told in the annual report by E. J. Kulas, president.

Widening of the company's hot and cold strip mills, together with the installation of additional auxiliary equipment, has increased the company's finishing capacity and enabled it to handle a wider diversity of products, with reduction in production costs, said Mr. Kulas.

Net loss for Otis Steel for 1938 amounted to $1,230,296 after deduction for depreciation amounting to $1,080,555 and after repairs, maintenance and renewal expense of $1,153,594. The company's statement showed current assets of $9,950,907 as against current liabilities of $1,696,576. Capital expenditures for the year amounted to $1,170,173.

Stromberg Electric Co. has changed its name to the Stromberg Time Corp. and moved its general offices to 109 Lafayette Street, New York.

. . . PERSO

EDWARD T. MURPHY, recently named vice-president in charge of marketing, Carrier Corp., Syracuse, N. Y. He has been associated with the company since 1901.

B. W. DREYER has been transferred to Los Angeles as district manager for Steel & Tubes, Inc., Republic Steel Corp. subsidiary. Mr. Dreyer joined Steel & Tubes, Inc., in 1929 and in March, 1936, was transferred to Indianapolis.

T. M. EVERHARD, who went with the company in 1936 as a sales apprentice, succeeds Mr. Dreyer. He was transferred to Indianapolis around the first of this year.

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E. J. KULAS, president, Otis Steel Co., Cleveland, and W. E. WICKENDEN, president, Case School of Applied Science, Cleveland, have been elected directors of Apex Electrical Mfg. Co., Cleveland.

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GEORGE DELANEY, Pontiac Motor Car Co. engineer, has been nominated as chairman of the Detroit section of the Society of Automotive Engineers for 1939-40. Others named as candidates for positions on the Governing Board are L. A. CHAMINADE, Chevrolet Motor Co., secretary; F. W. MARSCHNER, New Departure Mfg. Co., treasurer; TORE FRANZEN, Chrysler Corp., vice-chairman, passenger car activity; WILLIAM J. O'NEIL, general manager, Dodge Division, Chrysler Corp., production; JOHN W. VOTYPKA, Fruehauf Trailer Co., body design; PROF. EDWARD A. STALKER, University of Michigan, aeronautics; V. C. YOUNG, Wilcox-Rich Co., junior-student activity; JOHN H. HUNT, General Motors Corp., section representative of the national nominating committee; ROBERT N. JANEWAY, Chrysler Corp., section representative on the national sections committee.

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WILLIAM E. BURNS has been added to the sales department of the machinery division of Ex-Cell-O Corp., it has been announced by THOR M. OLSON, vice-president in charge of sales. Mr. Burns went to Ex-Cell-O five years ago from the Ford Motor Co. where he served his apprenticeship as tool maker. More recently he has been supervisor of precision thread grinder assembly. In the sales department he replaces Ernest Straw, now with W. S. Gallagher Co.

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CARL L. HALPIN, formerly purchasing agent of Square D Co., Detroit, has resigned to go with Fisher Body Corp., Grand Rapids, Mich. E. W. TIDERINGTON, who for several years was assistant purchasing agent at Square D and later was in the purchasing department of Ainsworth Mfg. Co., has been named to succeed Mr. Halpin.

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WHIPPLE JACOBS, former vice-president in charge of sales of the Belden Mfg. Co., Chicago, was elected president last week of the electric wire and cable concern, to succeed the late Joseph C. Belden, who died Feb. 17. HOPEWELL L. ROGERS, formerly vice-chairman, was named chairman of the board, also succeeding Mr. Belden. CHARLES S. CRAIGMILE, a vice-president, and HERBERT POPE, attorney, were chosen as new directors of the company, to replace Mr. Belden, and JOHN W. O'LEARY, who resigned.

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REZEAU B. BROWN, who joined the Milwaukee Gas Light Co., Milwaukee, as chief engineer in 1901, and later became president and general manager, is retiring on April 1. He will be succeeded by BRUNO RAHN, present vice-president and general manager. Mr. Rahn started with the company as an office boy in 1900, and several years later was given a course in mechanical engineering at the University of Wisconsin, from which he was graduated in 1907 and rejoined the company. Mr. Brown also is retiring from the presidency of the Milwaukee Coke & Gas Co., affiliate of the Gas Light company. In this capacity he will be succeeded by J. A. B. LOVELL, head of the Hamilton Coke & Iron Co., Hamilton, Ohio, division of the American Rolling Mill Co. All of the companies are members of the American Light & Traction Co., New York, of which Mr. Brown was president for 10 years until his retirement a number of years ago.

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C. A. WILLSON, structural engineer of the Wisconsin State architect's office at Madison, Wis., has been elected president of the Engineering Society of Wisconsin. JAMES L. FEREBEE, chief engineer of the Milwaukee Sewerage Commission, was elected vice-president. RAY S. OWEN of Madison, secretary-treasurer for 11 years, declined reelection and his successor will be named later by the board. DR. FRANZ A. KARTAKN, Dean of the college of engineering of Marquette University, Milwaukee, and G. C. WILSON, associate professor of mechanical engineering, University of Wisconsin, were elected trustees for two-year terms.

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SENATOR EDWARD R. BURKE of Nebraska will speak on "Why We Must Amend the Wagner Act" at the monthly dinner meeting of the Wisconsin chapter, American Foundrymen's Association, on April 21 at the Hotel Schroeder in Milwaukee.

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CHARLES R. WALLANDER, JR., has been placed in charge of the newly-opened New York office, at 7 Dey Street, of the Granite City Steel Co., Granite City, Ill. J. E. SWEENEY has been appointed to head the company's new Indianapolis office, at 3957 Ruckle Street.

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GEORGE J. HELFRICH, who has been associated with the Reading-Pratt & Cady Division of American Chain & Cable Co. since 1925, has been appointed Chicago district sales manager, with headquarters at 400 West Madison Street.

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ARTHUR NORDQUIST, of Flinn & Dreffein Co., Chicago, has sailed for

RSONALS . .

Calcutta, India, to construct six large pack and pair furnaces for the new sheet mill of the Steel Corporation of Bengal.

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W. W. PEATTIE, president, Northern Engineering Works, Detroit, has been elected chairman of the Electric Hoist Manufacturers Association, succeeding J. F. COOKE, of the American Engineering Co. WILLIAM WHITE, secretary and general manager of the Euclid Crane & Hoist Co., Euclid, Ohio, has been elected vice-chairman.

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DONALD J. RIDDELL, formerly identified with the Philadelphia works of the General Electric Co., has been appointed Eastern district representative for Progressive Welder Co., Detroit. He will make his headquarters at 2308 Chestnut Avenue, Ardmore, Pa., and will be in charge of sales in all states east of Ohio.

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WALTER H. KURTZ, general superintendent of maintenance of the Sheffield Steel Corp., Kansas City, was recently awarded the Palms of an officer of the French Academy. He served in the World War as a special technical engineer under Gen. W. W. Atterbury.

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HENRY W. ERICKSON, engineer in the crushing, cement and mining division of Allis-Chalmers Mfg. Co., Milwaukee, has been transferred to the El Paso district office where he will specialize on mining machinery. Mr. Erickson joined the Allis-Chalmers organization in 1929.

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JOSEPH FAL, service man at Houston for the Warner & Swasey Co., Cleveland, who is temporarily going to France to do supervisory work in connection with a large Warner & Swasey installation, is being succeeded during his absence by ELMER WROBBEL, who has been doing service work for the company in the northeastern part of the United States during the past five years.

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MILTON LEVENSON, of Roxbury Iron & Metal Co., Dorchester, Mass., has been appointed chairman of the welfare committee of the Institute of Scrap Iron and Steel.

HERBERT L. LURIA, of Luria Brothers & Co., Philadelphia, has been made chairman of the railroad scrap committee of the institute.

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VICTOR BROOK, formerly chief engineer and sales engineer of the High Speed Hammer Co., Rochester, N. Y., has resigned to become a manufacturers' representative in the Up-State New York area, handling High Speed Hammer Co. products among others. His headquarters will be at 433 Rockingham Street, Rochester.

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FRANK W. CURTIS, at one time manager of the Firthite Division of the Firth-Sterling Steel Co., McKeesport, Pa., is now chief engineer of the Van Norman Machine Tool Co., Springfield, Mass. Mr. Curtiss, who is the author of several books and many articles on cutters and tools, for many years was research engineer for the Kearney & Trecker Corp., Milwaukee.

CARL A. OSTLING, whose appointment as vice-president in charge of production, Carrier Corp., Syracuse, N. Y., was announced in last week's issue. Mr. Ostling goes to Carrier from General Motors where he was in charge of industrial engineering of the Pontiac division.

Pennsylvania Works Laws Found Faulty

PITTSBURGH—The Pennsylvania State Supreme Court meeting here this week has declared four "liberal" provisions of the Pennsylvania workmen's compensation laws unconstitutional on the basis that they would place a crushing burden on industry with a resultant loss of employment.

The high court also returned to the Dauphin County court the question of reasonableness of rates which had been increased by recent legislation.

Provisions declared unconstitutional were those holding employers responsible for compensation of employees of subcontractors, whether or not the employees are injured on the employer's premise; entitling the employee to compensation for injuries sustained in the course of employment, even though engaged in an unlawful act; holding that the mere presence of an occupational disease results in favor of the employee, and last, providing that the mere fact that an employee has been injured presumes that the employer's negligence caused the injury.

The provisions declared unconstitutional were among those protested by numerous employers who claimed the liberal purposes of the provisions imposed excessive burdens on industry.

National Steel Corp. May Offer Bonds

PITTSBURGH—National Steel Corp., it has been learned, has under consideration a new bond financing, but no decision has been reached. It is believed that any plan for new financing might represent refunding.

At the end of 1938, National Steel had outstanding $47,000,000 in first mortgage 4 per cent bonds callable at $105, and $9,600,000 first mortgage 3¾ per cent bonds callable at $105.50. Under present conditions it is anticipated that should National Steel refund, the interest rate on the new bonds would be no more than 3 per cent.

Present directors of National Steel have been reelected.

REINFORCING STEEL

. . . Awards of 10,900 tons; 3500 tons in new projects.

ATLANTIC STATES AWARDS

800 Tons, Richmond, Va., warehouse, U. S. Tobacco Co., to Truscon Steel Co., Youngstown; through John Felmley, Bloomington, Ill., contractor.

492 Tons, Passaic County, N. J., five highway bridges, to Bethlehem Steel Co., Bethlehem, Pa., through Ell-Dorer Contracting Co., contractor.

300 Tons, Great Kills, N. Y., grade crossing elimination, to Truscon Steel Co., Youngstown, Ohio; through Poirier & McLane Corp., New York.

250 Tons, Cortland, N. Y., Central Grade and High School, to Bethlehem Steel Co.; through Kraft & Detor, Syracuse, N. Y., contractors.

180 Tons, Trenton, N. J., school building, to Concrete Steel Co., New York.

160 Tons, Franklin, Pa., sewage treatment plant, to Fort Pitt Bridge Works, Pittsburgh; through Couse & Sanders, Detroit, contractors..

140 Tons, Harrisburg, Pa., store building, to Bethlehem Steel Co., Bethlehem, Pa.

115 Tons. Philadelphia Navy Yard building, to Truscon Steel Co., Youngstown.

100 Tons, Corfu, N. Y., Central High School, to Bethlehem Steel Co., Bethlehem, Pa.

CENTRAL and WESTERN STATES

2600 Tons, Odair, Wash., Grand Coulee Dam (Invitation A-39293-A), to Bethlehem Steel Co., San Francisco.

1440 Tons, Huntington, W. Va., U. S. Engineer Invitation 516-39-240, to West Virginia Rail Co., Huntington, W. Va.

725 Tons, St. Louis, post office garage, to Laclede Steel Co., St. Louis; through J. S. Alberici, St. Louis, contractor.

560 Tons, Berkeley, Cal., overcrossing, to Columbia Steel Co., San Francisco.

541 Tons, Fresno, Cal., post office and courthouse, to Ceco Steel Products Co., San Francisco; through James I. Barnes, Santa Monica, contractor.

475 Tons, Toledo, Ohio, library, to Pollak Steel Co., Cincinnati; through Frank Messner & Sons, Cincinnati, contractors.

400 Tons. Stevens Point, Wis., sewage plant, to Joseph T. Ryerson & Son, Inc., Chicago.

300 Tons, Milwaukee, Wells Street apartment, to Truscon Steel Co.; through W. H. Pipkorn, Milwaukee, contractor.

250 Tons. Milwaukee, Cherry Street bridge, to Youngstown Sheet & Tube Co., Youngstown; through Worden-Allen Milwaukee.

225 Tons. East Lansing, Mich., auditorium, to Capitol Steel Corp., Lansing.

200 Tons, Pontiac, Mich., sewage disposal plant, to Pollak Steel Co., Cincinnati.

200 Tons, Elgin, Ill., Fox River bridge, to Ceco Steel Products Co., Omaha.

125 Tons, Ann Arbor, Mich., factory building, King-Seeley Corp., to Joseph T. Ryerson & Son, Inc., Chicago.

120 Tons, Huntington, W. Va., court house addition, to West Virginia Rail Co.; through Engstrom & Wynn, contractors.

110 Tons. Mare Island, Cal., Navy shop superstructure, to W. S. Wetenhall Co., San Francisco.

100 Tons, Athens, Ohio, men's and women's dormitories, Ohio University, to West Virginia Rail Co.; through Robert H. Evans Co., Columbus, contractors.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

555 Tons, Queens, New York, Cross Island Parkway, Elmhurst Contracting Co., Elmhurst, N. Y., low on contract MC-39-7; National Excavation Co., New York, low bidder on contract SC-39-5, and Andrew Weston Co., Woodmere, N. Y., low on contract MC-39-9.

300 Tons, Harrisburg, Pa., Clark Valley dam.

185 Tons, State of New Jersey, four highway bridges, route No. 6, between Clifton and Little Falls, N. J.; bids close April 14.

175 Tons, Clyde, N. Y., school; bids April 7.

130 Tons, Mount View, N. J., railroad bridge; bids close April 14.

115 Tons, Philadelphia, Pa., commissary building alterations and additions, Horn & Hardart.

CENTRAL and WESTERN STATES

500 Tons, Chicago, Western Avenue bridge; new bids April 5.

460 Tons, Joplin, Mo., viaduct; Garrett Construction Co., Springfield, Mo., low bidder on general contract.

410 Tons, Buena, Wash., Yakima project (Invitations A-33846-A and A-33845-A); bids March 30.

248 Tons, St. Louis-Chippewa Street underpass; Stiers Construction Co., St. Louis, low bidder on general contract.

227 Tons, Chicago, Laramie Avenue viaduct, Morris Handler Co., Inc., Chicago, low bidder.

200 Tons, Carrville, La., addition to Marine Hospital; Raisler Engineering Co., New York, low bidder on general contract.

200 Tons, Cincinnati, Franklin Avenue viaduct.

132 Tons, Sunol, Cal., bridge; bids April 12.

115 Tons, Bryan, Ohio, rail steel bars for sewage plant; bids taken March 29.

100 Tons, Mono County, Cal., Long Valley Dam; bids April 8.

Unstated tonnage, Cleveland, cut No. 4, Cuyahoga River straightening; bids due March 30.

Hearings on Wagner Act Set for April 11

WASHINGTON.—The Senate Education and Labor Committee, faced with a growing demand for hearings on several pending bills to revise the Wagner Act, has scheduled hearings for April 11. Senator Wagner, co-author of the law which created the NLRB, will be the first witness.

Senator Thomas, committee chairman, had previously fixed a date but later canceled hearings on the assumption they might adversely affect the current negotiations between the AFL and the CIO.

U. S. to Build Two 45,000-Ton Battleships

WASHINGTON—The Navy Department is expanding construction facilities at the Philadelphia and New York Navy Yards to accomodate battleships up to 45,000 tons, which were authorized in the naval expansion law enacted by the 75th Congress.

President Roosevelt has given the Navy authority to build two 45,000 ton ships, the largest ever to be built in the United States.

. . . PIPE LINES . . .

General Gas Pipe Line Corp., Circle Tower Building, Indianapolis, will have hearing before Federal Power Commission, Washington, on April 17 for authority to proceed with proposed 20-in. welded steel pipe line from gas field in Hart County, Ky., to connection with present main pipe line system in Hamilton County, Ind., about 180 miles, for natural gas transmission. Also will build several 3, 4, 6 and 8-in. steel pipe lines for gathering system in gas district noted, as well as lateral lines, approximating 40 miles in all. Cost over $1,000,000 with compressor and control stations, and other operating facilities.

Waveland, Miss., plans pipe lines for municipal natural gas distribution, with main welded steel pipe line from Bay St. Louis to town limits, for bulk supply. Control station will be built at Bay St. Louis. Special election has been called on April 8 to approve bond issue of $45,000 for project. F. P. Joseph, Glenora, La., is consulting engineer.

Niagara Hudson Power Corp., Electric Building, Buffalo, plans pipe lines for extensions and replacements in gas transmission and distributing system in different parts of State during 1939. Appropriation will be arranged from fund of $25,000,000 authorized for expansion and improvements in electric and gas properties during year.

Hanley & Bird, Kennedy Street, Bradford, Pa., natural gas operators, plan pipe lines in connection with drilling and development of new gas wells in natural gas area near Woodhull, Steuben County, N. Y., including several 6-in. lines. Cost reported over $75,000. F. E. Eckert is general manager.

Harry Nelson & Co., Inc., Baton Rouge, La., plans welded steel pipe lines from gas field near Louisiana State University to College Hills Annex and University Acres districts, for natural gas transmission for distribution in latter territories, where pipe line systems will be provided.

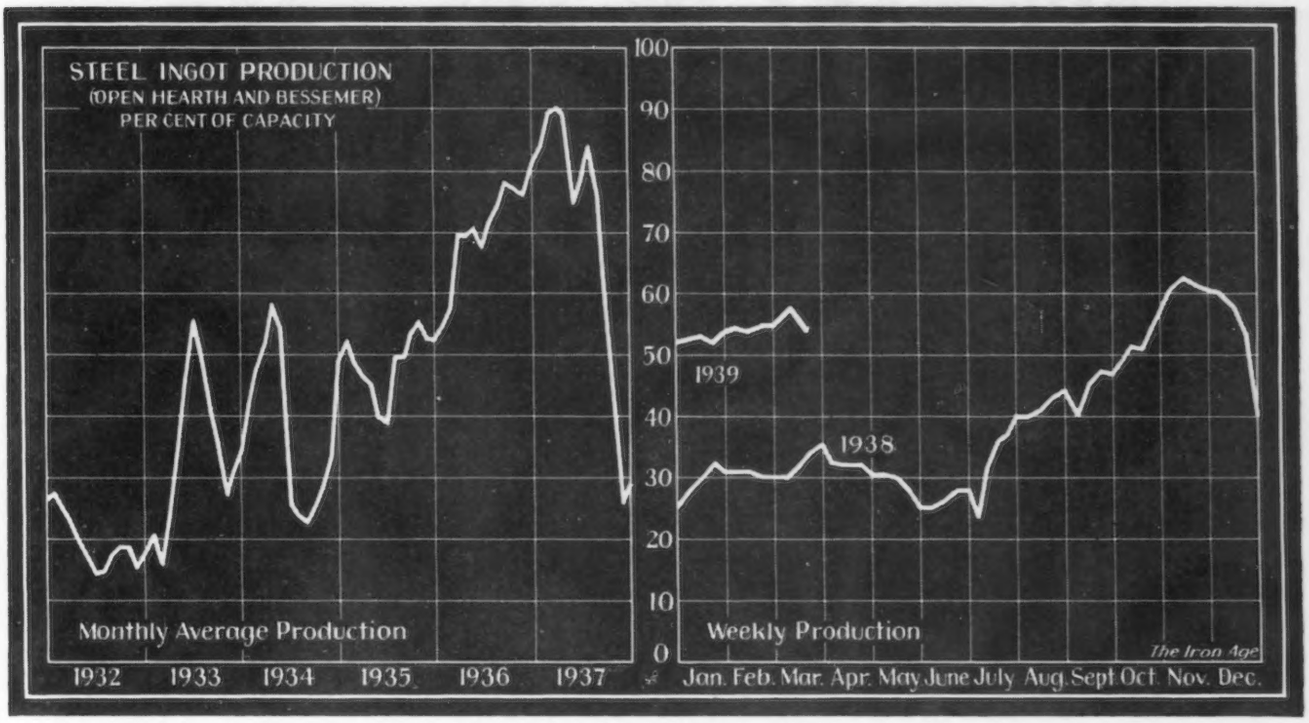
North Dakota Consumers Gas Co., Mandan, N. D., R. R. Wolfer, president, organized a few months ago, is having hearings before Federal Power Commission, Washington, for permission to proceed with proposed welded steel pipe line from Mandan to Crookston, Minn., by way of Fargo, Jamestown, Hillsboro, Valley City and Grand Forks, N. D., for natural gas transmission. Several lateral pipe lines will be built, as well as pipe line distribution systems in different communities. Entire project is estimated to cost $4,254,300 and financing in part is being arranged through Federal aid. Commission has assumed jurisdiction over proposed system, which will include compressor and control stations and other operating facilities.

South American Gulf Oil Co., 135 East Forty-second Street, New York, an interest of Texas Co., same address, has begun construction of new welded steel pipe line from Catatumbo, Colombia, oil field district to Covenas, Colombia, on Atlantic coast, where large bulk terminal will be located. Cost reported over $750,000. Completion is scheduled in about six months.

Santa Rosa, Cal., has awarded 11,000 ft. of 6-in. pipe and fittings to California Corrugated Culvert Co., Berkeley, Cal.

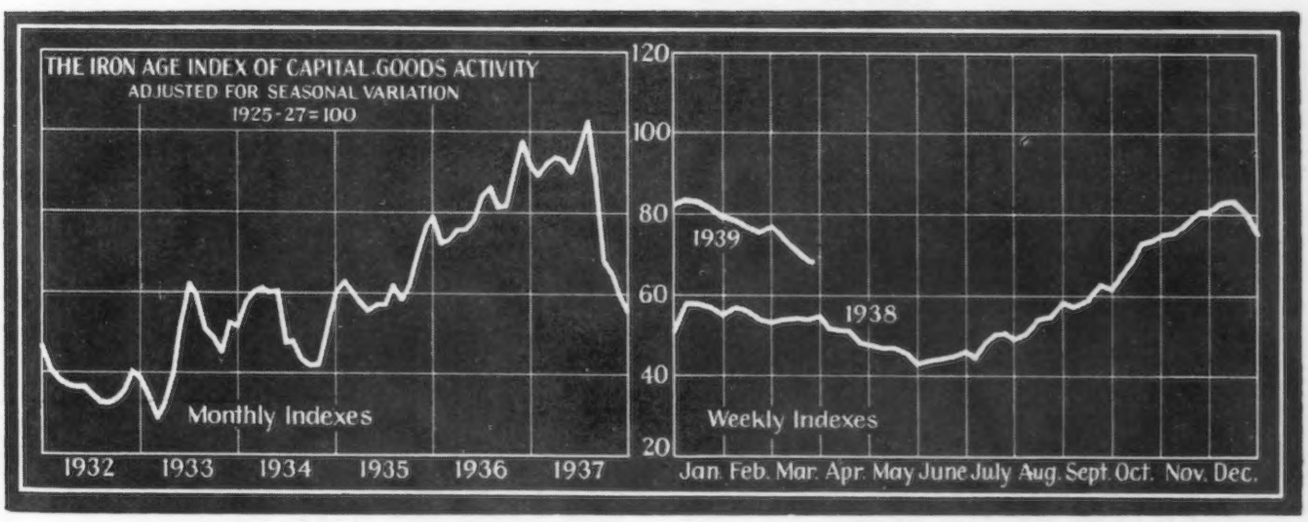
Los Angeles asked bids March 27 on 40,000 ft. of ½ to 2-in. galvanized wrought steel pipe (Specification 3888).

Ingot Output Declines a Half Point to 55 Per Cent



District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	Western	St. Louis	East-ern	Aggre-gate
CURRENT WEEK..	52.0	53½	51.0	38.0	53.0	36.5	76.0	62.5	60.5	55.5	60.0	45.0	75.0	**55.0**
PREVIOUS WEEK..	52.0	56.5	50.0	39.0	55.0	36.5	65.0	72.0	72.0	55.5	60.0	51.5	75.0	**55.5**

Capital Goods Index Off Slightly to 73.2



THE weakness that has been in evidence for the past two months in THE IRON AGE index of capital goods activity continues to be the chief feature of its movement. There were signs of firmer tendencies in several series of the index in the past week, but a 4.6-point drop in the heavy construction factor, coupled with a one-point decline in the steel output series, resulted in a loss for the week of 0.8 point. The index now indicates activity at the rate of 73.2 per cent of the base years 1925-27. At this position, the index is substantially above the 1938 level for this time of the year, but it also shows a progressive decline from the beginning of the present year. The average index in January was 82.4. In February it was 77.3 and for March, through the 25th, it was 74.5.

	Week Ended Mar. 25	Week Ended Mar. 18*	Comparable Week 1938	Comparable Week 1929
Steel ingot production[1]	71.3	72.3	45.9	119.2
Automobile production[2]	82.3	82.3	49.6	127.2
Construction contracts[3]	91.4	96.0	73.5	142.4
Forest products carloadings[4]	47.5	47.3	49.6	119.2
Production and shipments, Pittsburgh District[5]	73.4	72.2	53.4	116.5
Combined index	**73.2**	**74.0**	**54.4**	**124.9**

Sources: 1. THE IRON AGE; 2. Ward's Automotive Reports; 3. *Engineering News-Record;* 4. Association of American Railroads; 5. University of Pittsburgh.

. . . SUMMARY OF THE WEEK . . .

. . . Steel orders sagging in some lines; operations lower.

° ° °

. . . Mixed trend develops in scrap; composite price is higher.

° ° °

. . . Confidence still exists that second quarter will be fair.

THE steel industry winds up the first quarter on a note of hesitation. March business made no substantial gains. Sales of some products barely broke even with those of February, exceptions being tin plate and structural steel.

Production of ingots is estimated by THE IRON AGE to be slightly lower this week at 55 per cent of the industry's capacity. The change in the average is insignificant, but of importance is the fact that in the Birmingham district, where operations have been steady for several weeks, there has been a drop of three furnaces, reducing the rate from 72 per cent to 60½ per cent, while in Detroit, where buying by the automobile industry has been below expectations, one plant has reduced to 10 open hearths out of 16 available; a steel company blast furnace at Birmingham has been banked. While Pittsburgh district operations remain steady at 52 per cent, the Chicago district has dropped three points to 53½ per cent, the Cleveland-Lorain district is two points lower at 53 per cent and the St. Louis district has dropped sharply to 45 per cent.

Partly offsetting these losses are gains in the Wheeling-Weirton area, which is up 11 points to 76 per cent, and in the Youngstown district, which is up one point to 51 per cent.

If the steel industry were solely dependent on current buying, operating rates would be lower than they are. However, the volume of business that has been placed during the past two or three months, particularly in rails, track accessories, car material, structural steel and tin plate, is a sustaining factor in operating schedules.

Despite the discouragement caused by the failure of steel business to expand in the degree that had been expected by many in the trade, there is still confidence that the second quarter will make a fairly good showing, possibly bringing some improvement over the first quarter.

A MIXED trend has developed in scrap markets. A slight easing in the price for No. 1 heavy melting steel at Pittsburgh has brought a reduction of 12½c. a ton in the average there, but this is more than offset by an average advance of 25c. at Philadelphia, reflecting small purchases by consumers. The Philadelphia situation has been more greatly influenced by export shipments than by domestic demand. Negotiations with representatives of the International Scrap Convention, who are in this country, have reached no conclusion, being held up, it is said, by a difference in views as to price. The Japanese, however, are expected to make further purchases soon. Though scrap is more plentiful at some points, particularly Chicago and Youngstown, prices have not eased except at Pittsburgh. Because of the rise at Philadelphia, THE IRON AGE scrap composite price is up 12c. to $15.29, the highest figure since October, 1937.

THE sagging of steel orders has probably been more pronounced in sheets and strip than elsewhere. Whether this is a result of inventories built up by consumers from coverages made last fall at low prices is not clear.

At least two automobile companies in the Detroit district appear to have sufficient steel to complete their runs on 1939 models. Some other companies may require only fill-in lots. Buying of steel for try-out runs on 1940 models is not expected before May.

New structural steel work this week is in light volume, awards totaling only about 12,000 tons, none taking as much as 1000 tons. Inquiries total only 15,400 tons, of which 3000 tons is for a school in Chicago, 2500 tons for two bridges at Pollock, Cal., 1200 tons for an infirmary at Willowbrook, N. Y., and 1000 tons for a pumping station in Chicago. Reinforcing steel lettings of about 11,000 tons include 2600 tons for work at Grand Coulee Dam and 1440 tons for U. S. Engineers at Huntington, W. Va.

Buying of rails and rolling equipment by the railroads has dropped to a low point, though a considerable number of cars are pending.

PRICE developments include an advance of $2 a ton on lawn fence, the reaffirmation of prices on bolts, nuts and rivets, with stove bolts and upset cap screws slightly higher, and a firming up in prices of reinforcing bars in several markets.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	Mar. 28, 1939	Mar. 21, 1939	Feb. 28, 1939	Mar. 29, *1938
Rails, heavy, at mill	$40.00	$40.00	$40.00	$42.50
Light rails: Pittsburgh, Chicago, Birmingham	40.00	40.00	40.00	43.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	37.00
Sheet bars: Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	37.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	37.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham	40.00	40.00	40.00	43.00
Wire rods: Nos. 4 and 5, Pittsburgh, Chicago, Cleveland	43.00	43.00	43.00	47.00
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows Point, cents per lb.	1.90	1.90	1.90	2.10

Finished Steel

Cents Per Lb.:	Mar. 28, 1939	Mar. 21, 1939	Feb. 28, 1939	Mar. 29, *1938
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.25	2.25	2.25	2.45
Plates: Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont	2.10	2.10	2.10	2.25
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham	2.10	2.10	2.10	2.25
Cold finished bars: Pittsburgh, Buffalo, Cleveland, Chicago, Gary	2.70	2.70	2.70	2.90
Alloy bars: Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton	2.80	2.80	2.80	3.00
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.15	2.15	2.15	2.40
Cold rolled strip: Pittsburgh, Cleveland, Youngstown	2.95	2.95	2.95	3.20
Sheets, galv., No. 24: Pittsburgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham	3.50	3.50	3.50	3.80
Hot rolled sheets: Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown	2.15	2.15	2.15	...
Cold rolled sheets: Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown	3.20	3.20	3.20	...
Wire nails: Pittsburgh, Chicago, Cleveland, Birmingham	2.45	2.45	2.45	2.75
Plain wire: Pittsburgh, Chicago, Cleveland, Birmingham	2.60	2.60	2.60	2.90
Barbed wire, galv.: Pittsburgh, Chicago, Cleveland, Birmingham	†3.30	3.30	3.30	3.40
Tin plate, 100 lb. base box: Pittsburgh and Gary	$5.00	$5.00	$5.00	‡$5.35

*Pittsburgh prices only.
†Applies to 80-rod spools only.
‡Subject to post-season adjustment.

Pig Iron

Per Gross Ton:	Mar. 28, 1939	Mar. 21, 1939	Feb. 28, 1939	Mar. 29, *1938
No. 2 fdy., Philadelphia	$22.84	$22.84	$22.85	$25.84
No. 2, Valley furnace	21.00	21.00	21.00	24.00
No. 2, Southern Cin'ti	21.06	21.06	21.06	23.89
No. 2, Birmingham	17.38	17.38	17.38	20.38
No. 2, foundry, Chicago†	21.00	21.00	21.00	24.00
Basic, del'd eastern Pa.	22.34	22.34	22.34	25.34
Basic, Valley furnace	20.50	20.50	20.50	23.50
Malleable, Chicago†	21.00	21.00	21.00	24.00
Malleable, Valley	21.00	21.00	21.00	24.00
L. S. charcoal, Chicago	28.34	28.34	28.34	30.24
Ferromanganese, seab'd carlots	80.00	80.00	80.00	102.50

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Scrap

Per Gross Ton:	Mar. 28, 1939	Mar. 21, 1939	Feb. 28, 1939	Mar. 29, *1938
Heavy melting steel, P'gh	*$15.875*	$16.00	$15.75	$13.50
Heavy melting steel, Phila.	**15.75**	15.25	15.25	14.25
Heavy melting steel, Ch'go	14.25	14.25	14.25	11.75
Carwheels, Chicago	13.00	13.00	12.50	13.50
Carwheels, Philadelphia	16.75	16.75	16.75	15.75
No. 1 cast, Pittsburgh	15.50	15.50	15.50	15.25
No. 1 cast, Philadelphia	16.75	16.75	16.75	15.75
No. 1 cast, Ch'go (net ton)	12.75	12.75	12.75	11.25

Coke, Connellsville

Per Net Ton at Oven:	Mar. 28, 1939	Mar. 21, 1939	Feb. 28, 1939	Mar. 29, *1938
Furnace coke, prompt	$3.75	$3.75	$3.75	$4.00
Foundry coke, prompt	4.75	4.75	4.75	5.00

Non-Ferrous Metals

Cents per Lb. to Large Buyers:	Mar. 28, 1939	Mar. 21, 1939	Feb. 28, 1939	Mar. 29, *1938
Copper, electrolytic, Conn.	11.25	11.25	11.25	10.00
Copper, lake, New York	11.375	11.375	11.375	10.125
Tin (Straits), New York	**46.50**	46.15	46.00	40.50
Zinc, East St. Louis	4.50	4.50	4.50	4.25
Zinc, New York	4.89	4.89	4.89	4.64
Lead, St. Louis	4.70	4.70	4.60	4.35
Lead, New York	4.85	4.85	4.75	4.50
Antimony (Asiatic), N. Y.	14.00	14.00	14.00	15.75

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
March 28, 1939	2.286c. a Lb.	$20.61 a Gross Ton	$15.29 a Gross Ton
One week ago	2.286	20.61	15.17
One month ago	2.286	20.61	15.08
One year ago	2.512	23.25	13.17
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.	Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel — High	Finished Steel — Low	Pig Iron — High	Pig Iron — Low	Steel Scrap — High	Steel Scrap — Low
1939					$15.17, Mar. 7	$14.875, Jan. 31
1938	2.512c., May 17	2.211c., Oct. 18	$23.25, June 21	$19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.73, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.223c., Apr. 2	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.192c., Dec. 11	2.142c., July 10	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 9

. . THIS WEEK'S MARKET NEWS . .

STEEL OPERATIONS

. . . Rate for country lower at 55% of capacity

AMONG the principal steel producing districts of the country there have been more declines in operations this week than gains. The rate for the industry is estimated by THE IRON AGE at 55 per cent, a half point lower than last week's estimate.

While the PITTSBURGH districts remain steady at 52 per cent the CHICAGO district has dropped three points to 53½ per cent. The CLEVELAND-LORAIN district is down two points to 53 per cent, DETROIT is down from 72 per cent to 62½ per cent, the BIRMINGHAM district has dropped from 72 per cent to 60½ per cent, and EASTERN PENNSYLVANIA is one point lower at 38 per cent.

The decline in operations in the SOUTH is the first change after several weeks of steady operations. Instead of 19 open-hearth furnaces being in operation there, this week's total is only 16, a loss of one each at Fairfield, Ensley and Gadsen.

The DETROIT drop is also significant. The Great Lakes Steel Corp. has dropped to 10 furnaces, the expected spring improvement in steel sales having failed to materialize.

The only important gains in production are in the WHEELING-WEIRTON district, which is up 11 points to 76 per cent, and in the Youngstown area, where a rise of one point brings the rate to 51 per cent.

PRICES

. . . Lawn fence advanced $2 . . . Stove bolts and upset cap screws slightly higher

With the opening of the second quarter, steel companies will face a substantial test on recent changes in selling practices involving the revised quantity discount setup and the elimination of jobber discounts of galvanized sheet products.

Lawn fence is up $2 a ton in all brackets. Prices on carriage, machine and plow bolts, lag screws and hot-pressed and semi-finished nuts have been reaffirmed for second quarter. Prices on stove bolts and upset cap screws have been advanced slightly.

Reinforcing bar prices are firmer in most districts.

NEW BUSINESS

. . . March has brought no gain in steel bookings

Total steel sales at PITTSBURGH during March on a daily basis will approximate bookings placed in February, but total tonnages ordered this month will show a very slight increase because of a greater number of working days. Demand in the past week at PITTSBURGH was virtually unchanged from a week ago, but an increase in tin plate orders is expected in the near future. Actual specifications against old orders, especially on structural, rail, and tin plate products, have been increasing recently and this condition is responsible for the maintenance of current operating rates, despite the failure of new business to show a marked increase.

At CLEVELAND and YOUNGSTOWN, the first quarter is closing with the steel industry's activity still on the horizontal basis which has prevailed for weeks. Aggregate incoming business during March showed only slight variation from February, the difference being accounted for by the additional days in March. Customers continue to buy on the hand-to-mouth basis. Structural steel and tin plate are still supplying much of the support for mills.

Orders received during the week enabled one CHICAGO sales office, which was 25 per cent behind February, to catch up to within only 8 per cent of last month's bookings. Another, however, fully expects its operations to decline within the week. Though orders for the month are not far behind shipments, many are for future delivery.

CHICAGO steel foundries report that February output and operations were less than orders received, while at malleable foundries production was ahead of new business, and shipments were just slightly under orders.

Tractor manufacturers are very busy. Farm purchasing power is slightly higher than a year ago, the horse population is diminishing, and a great interest in tractors is being expressed through the rural areas. One maker is reported to be 2000 tractors behind in its production, while another is turning out 225 daily in only one of several plants.

Construction continues as a bright spot in an otherwise clouded outlook at CHICAGO. Northwestern University alone last week announced two projects totaling more than $8,000,000, work to be started immediately.

PIG IRON

. . . Foundry activity is steady but not gaining much

WITH foundry activity in most districts barely holding steady, the demand for pig iron has not increased materially. There has been some contracting for second quarter, but in a quiet way, with no rush to buy. Prices are steady.

March shipments may run a little above those of February, but the difference will be accounted for mainly by a greater number of working days this month.

Some small foundries in New England that had been accustomed to getting pig iron by motor truck have had to order carload lots shipped by rail owing to a strike of truck drivers.

PLATES

. . . Specifications expand mildly at Pittsburgh

PLATE specifications have expanded mildly in the past few weeks and mill schedules at PITTSBURGH are slightly more active than a month ago.

A large amount of potential business for CHICAGO plate sellers is indicated by good second quarter prospects for considerable railroad car construction. Current bookings are miscellaneous in nature, a 500-ton order for fabrication into oil storage tanks featuring the past week.

Commercial Iron Works, Portland, Ore., was low bidder at $114,497 to United States Engineer, Bonneville, Ore., for a 35-ton whirler derrick boat.

Mills in EASTERN PENNSYLVANIA report a sharp decline in consumer demands for plates, traceable directly

to the fact that jobbers, tank shops and other miscellaneous users of plates are themselves experiencing a decline in business. The week's only activity involved 1200 tons, for 28 locomotives being built by Baldwin Locomotive Works, which was split among three large producers. Otherwise, the market is deriving most of its support from shipbuliders.

Business in the NEW YORK area is still dull. Bethlehem Steel Co. was awarded 7500 tons of plates for a section of the Delaware aqueduct in Ulster County, N. Y. Refinery equipment builders are figuring on a number of active proposals, but as yet have closed no new important contracts against which steel might be ordered. American Locomotive Co. has yet to buy the steel for the 15 Union Pacific locomotives it was recently awarded.

Industry Speaks

P. W. LITCHFIELD, president, Goodyear Tire & Rubber Co.—"A typical stockholder, a typical employee and a typical consumer — all look pretty much alike."

A. W. ROBERTSON, chairman, Westinghouse Electric & Mfg. Co.—"Should people on relief have the right to vote? If they lost this right when they went on relief it would be a tremendous incentive to get off relief in order to regain the right of citizenship. At present, a person on relief has little incentive to get off."

Industry Listens

"Be it known that the man, wherever he may be, who makes the charge that the CIO is an un-American institution, that it is comprised of Communists and has a leadership responsive to Communist principle, that man is a knave, a liar and a poltroon."—JOHN L. LEWIS.

"From Washington into every state capitol the ribbons of control stretch like guiding reins, each bearing the golden treasure of Federal largess, to drug the will and control the activities of our people."—GOV. HARLAN J. BUSHFIELD, S.D.

SEMI-FINISHED STEEL

. . . Better movement of tin bars expected

SEMI-FINISHED steel bookings continue on an even keel with little or no change noted in the past week's volume compared with that of the previous week. On a daily basis, orders in March will approximate tonnages placed in February. Producers look for acceleration in the movement of tin bars in the near future.

At CLEVELAND demand has been light recently for semi-finished, due to hesitancy upon the part of some non-integrated producers in the face of uncertainty over the probable extent of activity in April and May.

STRUCTURAL STEEL

. . . Mills getting heavier releases against old contracts

MILLS are getting somewhat heavier releases of structural steel against contracts placed during recent months, but the volume of new contracts shows no expansion this week. A good deal of work is still overhanging the market, however, and may afford fairly good operations during the second quarter.

Awards of fabricated structural steel during the week were mostly in small or moderate-size tonnages.

Among new inquiries are two bridges at Pollock, Cal., taking 2500 tons, and an infirmary building at Willowbrook, N. Y., calling for 1200 tons.

An award of 2000 tons of sheet piling for the substructure of a bridge to be built at Greenville, Miss., has been made to the Tennessee Coal, Iron & Railroad Co.

FERROMANGANESE

. . . Czecho-Slovak shipments cease, strengthening import prices

THE absorption of Czecho-Slovakia by Germany is expected to remove an important factor from the ferromanganese market and will probably result in higher prices on the imported material. In the past ferromanganese from the Czech territory, which is produced primarily from Russian ores, has been selling consistently below the domestic product. In January the foreign material was selling from $10 to $15 below the price of the domestic product and is credited with being instrumental in the reduction of domestic prices in January from $92.50 to $80 a ton. Currently the imported ferralloy is selling at $77.50 per ton, duty paid, seaboard, against $80 for the domestic grade. The assumption that ferromanganese from the Czech territory will be practically eliminated from the domestic market is based on the U. S. Treasury Department's removal of all material imported from this territory from the reciprocal trade agreement list and classifying it as of German origin. This ruling was accompanied by the imposition of a 25 per cent countervailing duty, which increases the import duty from $18 to about $33 a ton, rendering it practically impossible to do business in this market below present market prices.

REINFORCING BARS

. . . Awards substantial and considerable tonnage is pending . . . Prices firmer

CONCRETE bar awards have been substantial in the past week and, with prices continuing to hold firm, it is expected that other pending business will be placed by contractors who find it impossible to hold off any longer.

Concrete bar specifications at PITTSBURGH have been running slightly ahead of the February volume. West Virginia Rail Co. was awarded 1440 tons of bars for U. S. Engineers invitation 516-39-240 at Huntington, W. Va. Truscon Steel Co. will furnish the bars for a U. S. Tobacco Co.

warehouse at Richmond, Va., involving 800 tons.

CHICAGO sellers look forward to a good spring. A large amount of work is outstanding, prices are firming, and the proportion of private work to public is increasing. Several large construction projects have been announced recently in Chicago which will require fairly large bar tonnages.

Bethlehem Steel Co., SAN FRANCISCO, was awarded 2600 tons for Grand Coulee Dam on an invitation opened six weeks ago. Columbia Steel Co., SAN FRANCISCO, was awarded 560 tons by placer for an overpass at Berkeley, Cal., and Ceco Steel Products Co. took 541 tons for Fresno, Cal., post office.

MERCHANT BARS

. . . Orders are for small lots . . . Tonnage not gaining

ORDERS at PITTSBURGH continue fairly well diversified but total bookings are not as great as a week ago. The policy of purchasing on a day-to-day basis makes it difficult for producers to draw reliable conclusions regarding the volume of future production.

Demand at CLEVELAND recently has consisted of small orders, which in total have been insufficient to build up any appreciable volume. At YOUNGSTOWN sellers report the demand from diversified miscellaneous consumers is encouraging.

Buying from CHICAGO mills for automobile production is not large at the moment, but increased specifications are looked for later in the spring. Tractors currently are accounting for much of the tonnage booked.

BOLTS, NUTS, RIVETS

. . . Prices of stove bolts and upset cap screws up slightly

PRICES on carriage, machine and plow bolts, lag screws and hot pressed and semi-finished nuts have been reaffirmed for second quarter. Each price is now expressed in one discount rather than in a chain discount.

Prices on stove bolts and upset cap screws have been advanced slightly. Upset hexagon head cap screws are up approximately 4 per cent and square head set screws about 5 per cent.

Manufacturers report very little change in incoming orders from last week.

SHEETS AND STRIP

. . . New business in disappointingly small volume

NEW flat rolled business at PITTSBURGH has been extremely disappointing to producers in the past week. While miscellaneous demand has shown some signs of revival, and, while stove and refrigerator manufacturers have been more active recently, aggregate tonnages being placed are disappointing, especially in view of the time of year.

Flat rolled producers will face important testing of recent revisions and selling practices involving quantity deductions on sheets and strip, and elimination of functional discounts on galvanized products. Although these changes in some cases became effective upon announcement, they are to be definitely in effect on April 1.

Some further buying for 1939 motor car models is still expected by CHICAGO mills, with 1940 orders expected sometime during May. A non-seasonal decline in orders booked in February was noticed by stove and furnace makers, but they still are optimistic for the year as a whole. Tractor manufacturers are the most active of the farm equipment plants, but steel demand is not great. A fair tonnage of hot rolled sheets went into kitchen equipment of various kinds last week, increased building activity giving this industry a much improved outlook.

Incoming business at CLEVELAND shows very little change from other recent weekly periods. One auto manufacturer is expected to enter the market before long, but whether for "fill-in" tonnage or a larger buy is uncertain.

Demand for sheets from SOUTHERN OHIO producers bogged down the past week, with orders barely touching 50 per cent of capacity. Specifications for auto sheets are not expanding as anticipated while a small downward fluctuation in general ordering is reported.

Stove manufacturers in the Belleville (Ill.) district have been buying a fair tonnage of hot rolled sheets, with other orders in prospect. Other items are exceedingly quiet, it is reported from ST. LOUIS.

In PHILADELPHIA sheet bookings have dropped considerably in the past week. Although producers look at this decline as temporary, it is causing some concern. Jobbers are showing no interest in new purchases, miscellaneous consumption had dropped off considerably, and autobody stamping plants, instead of advancing production, are doing no more than holding steady.

Some sheet coverage is expected before the end of the week in the NEW YORK district to take advantage of the present quantity differentials over those effective April 1. On the other hand, jobbers, apparently with ample stocks, are not taking advantage of the period of grace before the functional allowance is eliminated.

TUBULAR GOODS

. . . Oil country orders a little better

OUTSIDE of a few orders from the Illinois field and some small line pipe work, demand at CLEVELAND and YOUNGSTOWN for tubular goods continues with very little change. March business probably will show a gain of around 10 per cent over February. Demand for merchant pipe is described as "just fair."

Merchant pipe stocks have not been moving out of NEW YORK jobbers' warehouses in the past two weeks owing to a plumbers' strike. Oil companies' orders in NEW YORK have improved somewhat.

RAILROAD BUYING

. . . Virginian buys 4000 tons of rails . . . Navy inquiring for 20 engines

THE Virginian Railway has ordered 4000 tons of rails, Carnegie-Illinois Steel Corp. to furnish 1000 tons and Bethlehem Steel Co. 3000 tons. Chicago & North Western recently placed orders for about 9000 tons of rails, divided between Carnegie-Illinois Steel Corp. and Inland Steel Co. This latest purchase by the C. & N. brings its aggregate rail orders placed so far this season to approximately 16,500 tons.

The Navy Department is taking bids on 20 locomotives of various types and the Denver & Rio Grande Western is inquiring for 100 steel underframes for 40-ton stock cars.

The Union Pacific has announced that 300 flat cars will be built in its OMAHA shops in the near future at a cost of $750,000. This is one of the items included in the 1939 expansion program announced recently and which will involve the expenditure of

more than $15,000,000 by the Union Pacific. The building of 2000 all-steel box cars was authorized some time ago.

The Chicago, Milwaukee, St. Paul & Pacific Railroad has applied to the Interstate Commerce Commission for authority to issue $1,920,000 in equipment trust certificates to finance the program calling for the construction of 1000 50-ton all-steel box cars and 75 cabooses at an estimated total cost of $2,762,500. The equipment will be constructed in the company's own shops. The cabooses are required as a part of a program for the replacement of 800 cabooses.

WAREHOUSE BUSINESS

. . . Changes made in prices of cold finished bars

A FEW minor adjustments in warehouse prices have been made at PITTSBURGH. The base on cold finished bars has been reduced 25c. a 100 lb. to 3.70c. a lb. Net price on quantities of 300 tons or less of cold finished bars has been reduced 50c. The 15c. a 100 lb. extra on small bar shapes such as Ts, Zs, etc., has been eliminated and the base price on these items is now the same as soft steel bars, or 3.60c. a lb. The prices mentioned here are delivered prices within the PITTSBURGH switching district.

At CLEVELAND, cold finished bars out of warehouse are now 3.80c. for city delivery, against 4.05c. previously. Due to the warehouse revision in cold finished quantity extras, consumers can now purchase up to 1500 lb. out of warehouse on the same price basis as from mills. March warehouse volume at CLEVELAND proved a little stronger than February, and slightly more diversified.

TIN PLATE

. . . Operations continue at about 60%

OPERATIONS this week remain at approximately 60 per cent, with producers expecting large can company commitments within the very near future. Some sources look for a substantial expansion in the operating rate by the first of May.

Tin plate buying, somewhat laggard earlier in the year, is now up to normal expectations of NEW YORK district sellers, who look to a substantially better volume than last year.

WIRE PRODUCTS

. . . Lawn fence advanced $2 a ton

TOTAL wire sales at PITTSBURGH are virtually unchanged from a week ago. Bookings of merchant wire products, however, on a daily basis are slightly ahead of February's. Manufacturers' wire demand at PITTSBURGH is receiving some impetus from refrigerator makers and there is slightly better activity at some motor car parts plants.

CLEVELAND producers report sales in the merchant division still suffering somewhat from the heavy coverage of January, but there are indications that this condition is nearing the end of the cycle.

Lawn fence is up $2 per ton in all brackets, except less carload lots, which are up $3 per ton.

Additional demand from makers of automobile seat cushion springs is expected within a week by CHICAGO sellers. Trade in merchant wire is unchanged but an upturn is confidently predicted for April and May.

Iron Workers Back On Jobs at Chicago

CHICAGO—About 500 members of the bridge and structural iron workers' union, employed on more than 100 private and public construction jobs in Chicago, on strike since last Thursday, have voted to return to work and submit their dispute to arbitration. The strike was called in protest against members of the Tunnel Workers Union installing reinforcing steel in the concrete work of Chicago's new subway. Officials of the Iron Workers' Union contend that if work on structural and reinforcing steel and steel forms, were turned over to them, 35 to 50 union members would be employed on each of the 12 units of the project for four to five months.

Imports at Philadelphia

PHILADELPHIA—The following iron and steel imports were received here during the past week: 36 tons of wire rods, 42 tons of steel tubes and 6 tons of steel bars from Sweden; 22 tons of steel bars, 28 tons of steel bands and 231 tons of structural shapes from Belgium.

Weekly Bookings of Construction Steel

	Week Ended				Year to Date	
	Mar. 28, 1939	Mar. 21, 1939	Feb. 28, 1938	Mar. 29, 1938	1939	1938
Fabricated structural steel awards	11,900	16,310	19,400	12,400	227,510	170,950
Fabricated plate awards	1,150	6,100	195	3,000	39,405	44,540
Steel sheet piling awards	3,540	1,125	400	0	13,205	7,760
Reinforcing bar awards	10,900	9,800	3,650	1,180	112,395	67,335
Total Letting of Construction Steel..	27,490	33,335	23,645	16,580	392,515	290,585

FABRICATED STEEL

. . . Lettings decline to 11,900 tons from 16,310 tons last week . . . New projects lower at 15,400 tons against 24,525 tons a week ago . . . Plate awards total 1150 tons.

NORTH ATLANTIC STATES

AWARDS

650 Tons, Carmel, N. Y., cont. No. 321, Delaware Aqueduct, to American Bridge Co., Pittsburgh.

500 Tons, Clifton, N. J., State bridges, to American Bridge Co., Pittsburgh.

460 Tons, Trenton, N. J., Cuyler School, to Bethlehem Steel Co., Bethlehem, Pa.

450 Tons, Ulster County, N. Y., head frames for Delaware Aqueduct, contract No. 313, to Archer Iron Co., Chicago, through Sam R. Rosoff, Ltd., N. Y.

440 Tons, Cambridge, Mass., addition to High and Latin School, to New England Structural Co., Everett, Mass., through Rugo Construction Co.

410 Tons, New York, apartment building, 73rd Street and Madison Avenue, to Dreier Structural Steel Co., New York.

315 Tons, Hyde Park, N. Y., Central Junior-Senior High School, to Belmont Iron Works, Philadelphia.

265 Tons, Princeton Junction, N. J., State highway bridge, to American Bridge Co., Pittsburgh.

250 Tons, Boston, rebuilding Berkely Street bridge, to American Bridge Co., Pittsburgh, through Coleman Brothers.

200 Tons, Salem, N. J., warehouse, Anchor Hocking Glass Corp., to Belmont Iron Works, Philadelphia.

200 Tons, Hamburg, N. Y., school; to Ernst Iron Works, Buffalo.

185 Tons, Poughkeepsie, N. Y., Violet Avenue school, to Ingalls Iron Works Co., Birmingham, through Caulway, Inc.

150 Tons, Chester-Vails Gate, N. Y., State bridge RC-4013, to American Bridge Co., Pittsburgh.

140 Tons, Cortland, N. Y., addition to high school, to American Bridge Co., Pittsburgh.

110 Tons, Augusta, Me., Rines Hill Railroad crossing, to American Bridge Co., through J. R. Partridge.

THE SOUTH

845 Tons, Houston, Tex., transmission towers, Houston Lighting & Power Co., to Emsco Derrick & Equipment Co., Los Angeles.

767 Tons, Estill County, Ky., State bridge, to Bethlehem Steel Co., Bethlehem, Pa.

235 Tons, Letcher County, Ky., State highway bridge, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

230 Tons, Uvalde County, Tex., bridge, to Austin Brothers, Dallas; through Colglazier & Hoff, San Antonio.

115 Tons, Dallas, Tex., Kroehler Co. warehouse, to Mosher Steel Co., Dallas.

110 Tons, Peach Creek, W. Va., signal bridges, Chesapeake & Ohio Railway Co., to American Bridge Co., Pittsburgh.

CENTRAL STATES

885 Tons, Toledo, Ohio, factory building for Toledo Scale Co., to Bethlehem Steel Co., Bethlehem, Pa., through A. Bentley & Sons.

450 Tons, Chicago, Ill., Dearborn Street subway, contract D-4, to American Bridge Co., Pittsburgh; through John Marsh, Inc.

400 Tons, Lorain, Ohio, B. & O. underpass, to Carnegie-Illinois Steel Co., Pittsburgh; through National Engineering Co.

330 Tons, Dearborn, Mich., alterations to cupola and foundry, to Taylor & Gaskin, Inc., Detroit.

310 Tons, Cleveland, two maintenance buildings for city, to Bethlehem Steel Co., Bethlehem, Pa.

265 Tons, Zanesville, Ohio, auditorium, to Guibert Steel Co., Pittsburgh.

250 Tons, Cleveland, building for American Magnesium Co., to American Bridge Co., Pittsburgh.

228 Tons, St. Louis, Mo., office and warehouse building, to Mississippi Valley Structural Steel Co., St. Louis; through Morton C. Tuttle Co.

205 Tons, Quincy, Ill., railroad bridges, to Joseph T. Ryerson & Son, Inc., Chicago.

200 Tons, Cleveland, storage building for Aluminum Co. of America, to American Bridge Co., Pittsburgh.

100 Tons, Wilmington, Ohio, school addition, to Champion Bridge Co., Wilmington.

100 Tons, Cincinnati, rollerdrome, Western Hills Rollatorium, Inc., to William Lang & Sons Co., Cincinnati.

WESTERN STATES

4000 Tons, Seattle, bridge, to Pacific Car & Foundry Co., Seattle; through Puget Sound Construction Co.

380 Tons, Powder River County, Mont., bridge project, to Missouri Valley Bridge & Iron Co., Leavenworth, Kan., through W. C. Roscoe.

307 Tons, Berkeley, Cal., overcrossing, to Moore Dry Dock Co., Oakland, Cal.; through Heaf-Moore Frederickson & Watson, Oakland, contractors.

190 Tons, Boulder City, Nev., Specification 1187D, Bureau of Reclamation, to International Derrick & Equipment Co., Columbus, Ohio.

152 Tons, San Francisco, Marina Junior High School, to Golden Gate Iron Works, San Francisco; through Monson Brothers, San Francisco, contractors.

105 Tons, Loveland, Colo., Bureau of Reclamation, to Joseph T. Ryerson & Son, Inc., Chicago.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

1200 Tons, Willowbrook, N. Y., infirmary buildings.

475 Tons, Washington, Taylor Street viaduct.

400 Tons, Clyde, N. Y., school; bids April 7.

300 Tons, Almond, N. Y., school; bids close April 5 (previously reported).

300 Tons, New York, dumping platform and shed, pier No. 99.

235 Tons, Norwich, Conn., Shetucket River bridge.

225 Tons, Wynnewood, Pa., apartment building, Wynnewood Park Corp.

200 Tons, Lynbrook, N. Y., alterations to high school.

180 Tons, Townsend, Vt., State bridge No. 19.

125 Tons, Halifax, Vt., State bridge.

115 Tons, Philadelphia, fat rendering plant, Wilson & Co.

THE SOUTH

940 Tons, State of Texas, underpass, bids in.

250 Tons, Newport, Ky., mill building, Andrews Steel Co.

235 Tons, Turtleton, Tenn., superstructure, Hiwassee power house, for TVA.

224 Tons, Brady, Tex., bridge; bids in.

215 Tons, Nallen, W. Va., State highway bridge.

145 Tons, Covington, Ky., factory building, Liberty Cherry & Fruit Co.

CENTRAL STATES

3000 Tons, Chicago, South Side vocational school; bids April 4.

1000 Tons, Chicago, pumping station.

365 Tons, Fairbury, Neb., State viaduct.

300 Tons, Marble Cliff, Ohio, State bridge.

280 Tons, Chicago, Wrightwood Avenue underpass; bids April 3.

250 Tons, Moselle, Mo., bridge over Mississippi River, St. Louis-San Francisco Railway.

200 Tons, Winnetka, Ill., track elevation project, seven temporary foot bridges; bids April 9.

195 Tons, Columbus, men's dormitory, Ohio State University.

175 Tons, Columbus, State bridge.

175 Tons, Oxford, Ohio, women's dormitory, Miami University.

140 Tons, Murray, Neb., State viaduct.

135 Tons, States of Missouri and Kansas, bridges, Missouri Pacific Railroad Co.

180 Tons, St. Louis, Chippewa Street underpass; Stiers Construction Co., St. Louis, low bidder on general contract (previously reported).

WESTERN STATES

1650 Tons, Pollock, Cal., Central Valley bridge project; bids April 21.

850 Tons, Pollock, Cal., Doney Creek bridge; bids April 21.

375 Tons, Miles City, Mont., highway bridge; bids in.

250 Tons, Bonner, Mont., State bridge, FAP-237-D.

140 Tons, Los Angeles, Remsen Avenue improvement district bridge; bids soon.

117 Tons, Seattle, Alaskan bridges; bids April 5.

100 Tons, San Francisco, Rincon Hill post office (revised tonnage); bids April 18.

FABRICATED PLATES

AWARDS

925 Tons, Kittery, Me., caissons for Piscataqua River bridge, to Turl Engineering Works, Inc., Cortland, N. Y.; through Frederick Snare Corp.

125 Tons, Marietta-Paducah, Ky., 20 and 24-in. pipe, for U. S. Engineer, Louisville, to American Rolling Mill Co.

100 Tons, Louisville, Ky., four fermenter tanks for Joseph E. Seagram & Sons, Inc., to Stacey Mfg. Co.

SHEET PILING

AWARDS

2000 Tons, Greenville, Miss., substructure for bridge across Mississippi River, to Tennessee Coal, Iron & Railroad Co.; through F. V. Ragsdale Construction Co., Memphis, Tenn., general contractor.

1350 Tons, Jamestown, R. I., Narragansett Bay bridge, to Carnegie-Illinois Steel Corp., Pittsburgh; through Merritt-Chapman & Scott Corp., New York.

190 Tons, Cleveland, Carter Road bridge superstructure, to Bethlehem Steel Co., Bethlehem, Pa.

FINANCIAL NOTES

Pittsburgh Screw & Bolt Corp. reports net loss of $350,948 in 1938, compared with profit of $1,252,698 or 83c. a share in 1937. Sales declined 57 per cent in dollar volume.

Westinghouse Air Brake Co., Wilmerding, Pa., reports net profit of $993,816 for 1938, equal to 32c. a share, compared with $2.01 per share in 1937. Net sales declined from $33,180,563 to $14,153,415. Signaling installations were sharply reduced and the operations of Union Swith & Signal Co. were conducted at a loss.

The Blaw-Knox Co. directors have been reelected for the ensuing year and stockholders have approved cancellation of the unexecuted portion of the stock purchase contract between the company and its president, William P. Witherow.

Empire Sheet & Tin Plate Co., Mansfield, Ohio, reports 1938 net loss of $423,978 compared with $243,415 net profit in 1937. President James M. Hill said the average operating rate during 1938 was 32.2 per cent of capacity compared with 71.3 per cent during 1937. Net sales for the year 1938 were $2,698,898 against $8,213,191 in 1937.

. . . NON-FERROUS . . .

. . . Copper continues dull . . . Lead more active . . . Spelter sales drop to 1382 tons . . . Tin quotas lowered to 40 per cent.

NEW YORK, March 28—Non-ferrous demand in the past week continued to reflect the tenseness felt here over recent developments abroad. Yet, despite the drab appearance of the domestic market, there were several encouraging factors. Notable in this respect is the continued expansion of lead consumption, as substantiated by one producer's report that releases against March bookings were practically 100 per cent in. Other signs were the comparative steadiness of the foreign price and the lowness of consumers' stock piles. Daily sales of copper the past week varied from 500 to 1400 tons, with the average for the month through Saturday being 900 tons. Fabricators are still drawing heavily from stock piles for current operations and buy only when the lowness of these piles jeopardizes operations. The producers' quotation remains unchanged at 11.25c. per lb., Connecticut Valley, for electrolytic metal, while the open market remains in the neighborhood of 10.75c. per lb. Foreign demand was sluggish all week with prices wavering between 10.30c. and 10.35c. per lb., c.i.f., usual base ports.

Tin

Spirited buying, especially by tin plate makers, developed last week immediately following announcement by the International Control Committee that second quarter quotas would be at 40 per cent against 45 in the first quarter. It is assumed that the buffer pool, which absorbed 10 percentage points of the first quarter output, has been filled and that all the 40 per cent will be available for sale. The committee also announced arrangements to liquidate over-exports of the past. This latter announcement gave the market a bullish tinge, despite the fact that five percentage points more will be available for sale in the coming quarter than in the first.

Lead

Sales in the past week were slightly in excess of 7400 tons, as compared with about 3100 in the previous week. Most of this tonnage was earmarked for April delivery, but over 2000 tons were sold for May at the market price. The week's buying makes March requirements about 95 per cent covered and April roughly 65 per cent. Encouraging feature of the present market is absence of speculative buying and the high rate of releases against contracts. Domestic prices were unchanged all week at 4.85c. per lb., New York, while this morning's London equivalent of 3.07c. per lb. represents a loss of five points from the price of a week ago.

Zinc

Prime Western sales last week slumped to 1382 tons from 4671 in the preceding week and 15,191 three weeks ago. This decline in sales volume coincided with the new European crisis and was not wholly unexpected. About 1000 tons of the week's sales were for nearby delivery, with the balance scattered through the second quarter. Shipments for the period, at 3844 tons, show no important deviation from past weeks' totals. Domestic prices are unaltered at 4.89c. per lb., New York. In London this morning spot spelter was 2.87c. per lb., down three points from a week ago.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Mar. 22	Mar. 23	Mar. 24	Mar. 25	Mar. 27	Mar. 28
Copper, Electrolytic[1]	11.25	11.25	11.25	11.25	11.25	11.25
Copper, Lake	11.375	11.375	11.375	11.375	11.375	11.375
Tin, Straits, New York	45.95	46.25	46.65	....	46.70	46.50
Zinc, East St. Louis[2]	4.50	4.50	4.50	4.50	4.50	4.50
Lead, St. Louis[3]	4.70	4.70	4.70	4.70	4.70	4.70

[1] Delivered Conn. Valley, deduct ¼c. for New York delivery. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Prices

Cents per lb., Delivered

	New York	Cleveland
Tin, Straits pig	47.50c.	49.75c.
Copper, Lake	12.25c.	12.375c.
Copper, electro	11.50c.	12.375c.
Copper, castings	11.25c.	11.875c.
*Copper sheets, hot-rolled	19.375c.	19.375c.
*High brass sheets	17.31c.	17.31c.
*Seamless brass tubes	20.06c.	20.06c.
*Seamless copper tubes	19.875c.	19.875c.
*Brass rods	12.62c.	12.62c.
Zinc slabs	6.25c.	7.00c.
Zinc sheets, No. 9 casks	10.50c.	12.10c.
Lead, American pig	5.85c.	5.60c.
Lead, bar	6.35c.	8.35c.
Lead, sheets, cut	8.00c.	8.00c.
Antimony, Asiatic	15.00c.	17.00c.
Alum., virgin, 99 per cent plus	22.50c.	22.50c.
Alum., No. 1 remelt., 98 to 99 per cent	19.50c.	19.50c.
Solder, ½ and ½	28.55c.	29.00c.
Babbitt metal, commercial grade	21.50c.	21.00c.

*** These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33 1/3; on brass sheets and rods, 40, and on brass and copper tubes, 25.**

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	8.375c.	9.125c.
Copper, hvy. and wire	7.375c.	7.875c.
Copper, light and bottoms	6.625c.	6.875c.
Brass, heavy	4.50c.	5.00c.
Brass, light	3.625c.	4.375c.
Hvy. machine composition	6.50c.	8.00c.
No. 1 yel. brass turnings	4.25c.	4.75c.
No. 1 red brass or compos. turnings	6.25c.	6.875c.
Lead, heavy	3.625c.	4.50c.
Cast aluminum	7.00c.	8.25c.
Sheet aluminum	12.25c.	13.75c.
Zinc	2.25c.	3.50c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered; virgin, 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt, No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt, New York; Asiatic, 14c. a lb., f.o.b.; American, 11.25c. a lb. QUICKSILVER, $88-$90 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 11c. a lb.

IRON AND STEEL SCRAP

. . . Mixed trends are discerned, with little mill buying . . . Composite is up 12c., however, to $15.29, new high for year.

MARCH 28—Several small orders have been placed with eastern Pennsylvania mills at as high as $16 for the No. 1 grade, raising the level of prices on that and related items 50c. At Pittsburgh, $16 is also being paid for No. 1 steel delivered into consumption, but there was one small sale at $15.75, lowering the average there 12½c. from a flat $16 quoted for the previous three weeks. With prices at Chicago unchanged, the net movement in THE IRON AGE composite price is 9c. upward to $15.29, high for the year thus far and the highest average since October, 1937. The gain from the low point of $14.875 at the end of January has been only 42c. In 1937, the gain for the comparable period was $3.09.

Little trading is being done, and in most districts prices are unchanged except those changes noted above. Track congestion is reported outside the yards of Chicago and Valley mills and at Buffalo, shipments are being held up by one of the leading consumers. Export broker buying prices are static as negotiations with the European cartel group have reached a stalemate. Japanese interests are expected to buy this week, however.

Pittsburgh

Although the undertone continues comparatively strong, the market for No. 1 steel is a trifle easier this week than was the case two weeks ago. A small sale into consumption of No. 1 steel has been made at $15.75 while other consuming points continue to pay $16 a ton. Brokers who had been paying as high as $16 a ton for No. 1 in covering old business are now able to pick up odd lots at $15.75 a ton, but there continue to be cases of broker covering at between this figure and $16. The quotation of a flat $16 a ton for No. 1 heavy melting steel has been eliminated this week in favor of a range of $15.75 to $16 a ton, which for the time being reflects current conditions and represents a drop of 12½c. a ton in the average price. Lack of new orders and the fact that a fair portion of old business has been covered have caused some brokers to be willing to sell moderate tonnages of No. 1 heavy melting steel into consumption at $15.75 a ton.

Chicago

This market is very quiet at the moment. Track congestion outside the plant of the leading buyer still presents a problem to some brokers. It is not believed that this mill will be in the market again for old material before the middle of April. A Rock Island Railroad list sold last week brought somewhere between $14.50 and $15, a decidedly weaker trend. No. 1 steel may be purchased by brokers for $14.25 and $14.

Philadelphia

Several small orders have been placed with domestic mills at higher prices, and No. 1 steel is now quotable at $15.50 to $16 and No. 2 at $13.50 to $14, delivered. Export prices are unchanged at 50c. lower than domestic, and buying for delivery to Port Richmond has been quite active. Foundry activity is showing a little more promise, and melters are showing greater interest in cast grades, but prices so far are showing no strength. General sentiment here is definitely on the bullish side, undoubtedly because domestic operations are holding to a better level than had been expected and bids for export material are mostly on the up side. One large holder of scrap in this area has been offered $17 f.o.b., but is holding out for even better bids.

Cleveland

The market continues strong here, following the moderate local buying reported last week. Both mills have bought for water shipment, but so far only Detroit scrap can be moved. Cargoes from Duluth, Chicago, and Milwaukee are not expected until the latter part of April. Quotations are unchanged.

Youngstown

Scrap is coming out more freely here, and some mills are receiving shipments a little faster than can be conveniently handled. In most quarters it is expected conditions will mark time until the extent of probable steel mill business for April can be gaged. Some buying in other nearby districts is looked for, however.

Buffalo

Shipments are again being held up by one of the principal mills in the district and the scrap situation remains quiet this week. The possibility of early sales, however, is sustained by the maintenance of last week's advance in steel operations. Cast, principally cupola, is still moving in fair volume.

St. Louis

Scrap iron prices in the St. Louis market are nominally unchanged. There has been no buying for several weeks and no trading is pending. Railroad lists: Pennsylvania, 13,000 tons; Chicago, Milwaukee, St. Paul & Pacific, 1500 tons; Chicago, Burlington & Quincy, 3500 tons, and St. Louis Southwestern, 150 tons.

Cincinnati

Some uncertainties as a result of the European situation have crept into the local market but no direct effect is discernible. Mill contracting is in fair volume. Dealer activity is confined largely to covering for mill specifications, with only small quantities being laid down.

Detroit

Late in the week the usual monthly automotive lists will be closed with little change in prices expected from advance indications. On the whole, estimated tonnages are close to last month's but several indications of reduced scrap output were seen in the estimated figures. April has 20 possible working days on a five-day basis, while March had a possibility of 23 and the plants actually operated only three to four days a week. Comparison indicates that no sharp increase in production is to be expected. There has been little movement of scrap from Detroit by vessel so far this season, although navigation in the lower Lakes is open and this fact may play some part in establishing the price level when bids are closed on current prices.

Toronto

Listlessness in the iron and steel markets is reflected in a slowing down in scrap sales. Current sales for scrap are to those melters that have standing orders such as the Steel Co. of Canada and some of the other large consumers. Small tonnage buying is reported from the smaller users. Local dealers have been adding to their holdings recently and considerable scrap, chiefly automobile scrap, has been arriving at a rapid rate. Cast scrap continues scarce.

New York

Dealers' buying prices on Nos. 1 and 2 steel on cars for domestic delivery are somewhat stronger in the light of higher delivered prices in eastern Pennsylvania. Heavy breakable cast is softer. Export buying prices are unchanged and the market is somewhat listless at the moment, pending new orders. The Japanese are expected to enter the market this week and it is predicted they will have to pay higher prices than obtained a month ago. Meanwhile, brokers have not been able to reach a price agreement with the visiting representatives of the European Scrap Cartel. Both sides would like to protect themselves against any drastic swings in price during the months over which delivery would be made. Sellers, in fact, are so anxious to prevent losses due to market changes that what might be considered a fair price at the moment offers no temptation.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$15.75 to $16.00
Railroad hvy. mltng.	$16.50 to 17.00
No. 2 hvy. mltng. steel	14.50 to 15.00
Scrap rails	16.50 to 17.00
Rails 3 ft. and under	18.25 to 18.75
Comp. sheet steel	15.75 to 16.00
Hand bundled sheets	14.75 to 15.00
Hvy. steel axle turn.	14.00 to 14.50
Machine shop turn.	10.00 to 10.50
Short shov. turn.	11.00 to 11.50
Mixed bor. & turn.	9.00 to 9.25
Cast iron borings	9.00 to 9.25
Cast iron carwheels	15.00 to 15.50
Hvy. breakable cast	12.50 to 13.00
No. 1 cupola cast	15.25 to 15.75
RR. knuckles & cplrs.	17.50 to 18.00
Rail coil & leaf springs	18.00 to 18.50
Rolled steel wheels	18.00 to 18.50
Low phos. billet crops	19.00 to 19.50
Low phos. punchings	17.50 to 18.00
Low phos .plate	17.00 to 17.50

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$15.50 to $16.00
No. 2 hvy. mltng. steel	13.50 to 14.00
Hydraulic bund., new	14.50 to 15.00
Hydraulic bund., old	11.50 to 12.00
Steel rails for rolling	17.00 to 17.50
Cast iron carwheels	16.50 to 17.00
Hvy. breakable cast	15.00 to 15.50
No. 1 cast	16.50 to 17.00
Stove plate (steel wks.)	13.00 to 13.50
Railroad malleable	15.50 to 16.00
Machine shop turn.	8.50 to 9.00
No. 1 blast furnace	6.50 to 7.00
Cast borings	6.50 to 7.00
Heavy axle turnings	10.00 to 10.50
No. 1 low phos. hvy	.... 17.00
Couplers & knuckles	.... 17.00
Rolled steel wheels	.... 17.00
Steel axles	20.00 to 20.50
Shafting	20.50 to 21.00
Spec. iron & steel pipe	12.00 to 12.50
No. 1 forge fire	12.00 to 12.50
Cast borings (chem.)	9.50 to 10.00

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel	$14.00 to $14.50
Auto. hvy. mltng. steel alloy free	12.50 to 13.00
No. 2 auto steel	11.50 to 12.00
Shoveling steel	14.00 to 14.50
Factory bundles	13.00 to 13.50
Dealers' bundles	12.50 to 13.00
Drop forge flashings	10.50 to 11.00
No. 1 busheling	12.50 to 13.00
No. 2 busheling, old	5.75 to 6.25
Rolled carwheels	16.00 to 16.50
Railroad tires, cut	16.00 to 16.50
Railroad leaf springs	16.00 to 16.50
Steel coup. & knuckles	16.00 to 16.50
Axle turnings	13.00 to 13.50
Coil springs	17.00 to 17.50
Axle turn. (elec.)	14.00 to 14.50
Low phos. punchings	16.50 to 17.00
Low phos. plates 12 in. and under	16.00 to 16.50
Cast iron borings	5.50 to 6.00
Short shov. turn.	7.50 to 8.00
Machine shop turn.	7.00 to 7.50
Rerolling rails	17.00 to 17.50
Steel rails under 3 ft.	16.25 to 16.75
Steel rails under 2 ft.	17.00 to 17.50
Angle bars, steel	16.00 to 16.50
Cast iron carwheels	12.75 to 13.25
Railroad malleable	16.00 to 16.50
Agric. malleable	11.25 to 11.75

	Per Net Ton
Iron car axles	$18.50 to $19.00
Steel car axles	18.00 to 18.50
Locomotive tires	14.00 to 14.50
Pipes and flues	9.50 to 10.00
No. 1 machinery cast	12.50 to 13.00
Clean auto. cast	13.00 to 13.50
No. 1 railroad cast	11.50 to 12.00
No. 1 agric. cast	10.25 to 10.75
Stove plate	7.75 to 8.25
Grate bars	9.00 to 9.50
Brake shoes	9.25 to 9.75

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$15.50 to $16.00
No. 2 hvy. mltng. steel	14.50 to 15.00
Low phos. plate	16.00 to 16.50
No. 1 busheling	14.75 to 15.25
Hydraulic bundles	15.00 to 15.50
Machine shop turn.	10.25 to 10.75

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$14.50 to $15.00
No. 2 hvy. mltng. steel	13.50 to 14.00
Comp. sheet steel	14.00 to 14.50
Light bund. stampings	10.75 to 11.25
Drop forge flashings	13.00 to 13.50
Machine shop turn.	7.50 to 8.00
Short shov. turn.	8.00 to 8.50
No. 1 busheling	14.00 to 14.50
Steel axle turnings	11.50 to 12.00
Low phos. billet and bloom crops	18.00 to 18.50
Cast iron borings	8.50 to 9.00
Mixed bor. & turn.	8.50 to 9.00
No. 2 busheling	8.50 to 9.00
No. 1 cupola cast	16.50 to 17.00
Railroad grate bars	9.50 to 10.00
Stove plate	9.50 to 10.00
Rails under 3 ft.	17.75 to 18.25
Rails for rolling	17.00 to 17.50
Railroad malleable	15.50 to 16.00
Cast iron carwheels	14.50 to 15.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$14.00 to $14.50
No. 2 hvy. mltng. steel	12.00 to 12.50
Scrap rails	15.00 to 15.50
New hvy. b'ndled sheets	12.00 to 12.50
Old hydraul. bundles	10.75 to 11.25
Drop forge flashings	12.00 to 12.50
No. 1 busheling	12.00 to 12.50
Hvy. axle turnings	10.50 to 11.00
Machine shop turn.	6.50 to 7.00
Knuckles & couplers	16.50 to 17.00
Coil & leaf springs	16.50 to 17.00
Rolled steel wheels	16.00 to 16.50
Low phos. billet crops	15.50 to 16.00
Shov. turnings	8.75 to 9.25
Mixed bor. & turn.	7.50 to 8.00
Cast iron borings	7.50 to 8.00
Steel car axles	16.50 to 17.00
No. 1 machinery cast	15.00 to 16.00
No. 1 cupola cast	14.50 to 15.00
Stove plate	13.00 to 13.50
Steel rails under 3 ft.	18.00 to 18.50
Cast iron carwheels	13.50 to 14.00
Railroad malleable	15.00 to 15.50
Chemical borings	9.00 to 9.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting	$12.00 to $12.50
No. 1 hvy. melting	12.00 to 12.50
No. 2 hvy. melting	11.50 to 12.00
No. 1 locomotive tires	13.00 to 13.50
Misc. stand. sec. rails	13.75 to 14.25
Railroad springs	14.00 to 14.50
Bundled sheets	7.50 to 8.00
No. 1 busheling	7.50 to 8.00
Cast. bor. & turn.	2.50 to 3.00
Machine shop turn.	4.00 to 4.50
Heavy turnings	9.00 to 9.50
Rails for rolling	16.00 to 16.50
Steel car axles	17.00 to 17.50
No. 1 RR. wrought	10.25 to 10.75
No. 2 RR. wrought	12.00 to 12.50
Steel rails under 3 ft.	16.00 to 16.50
Steel angle bars	14.00 to 14.50
Cast iron carwheels	14.50 to 15.00
No. 1 machinery cast	14.50 to 15.00
Railroad malleable	12.25 to 12.75
No. 1 railroad cast	12.50 to 13.00
Stove plate	8.50 to 9.00
Grate bars	9.00 to 9.50
Brake shoes	10.00 to 10.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	12.25 to 12.75
No. 2 hvy. mltng. steel	10.00 to 10.50
Scrap rails for mltng.	15.75 to 16.25
Loose sheet clippings	7.50 to 8.00
Hydrau. b'ndled sheets	11.75 to 12.25
Cast iron boring	4.00 to 4.50
Machine shop turn.	5.50 to 6.00
No. 1 busheling	8.25 to 8.75
No. 2 busheling	3.00 to 3.50
Rails for rolling	17.75 to 18.25
No. 1 locomotive tires	14.50 to 15.00
Short rails	18.50 to 19.00
Cast iron carwheels	13.00 to 13.50
No. 1 machinery cast	14.25 to 14.75
No. 1 railroad cast	13.00 to 13.50
Burnt cast	7.00 to 7.50
Stove plate	7.00 to 7.50
Agricul. malleable	12.00 to 12.50
Railroad malleable	14.50 to 15.00
Mixed hvy. cast	11.25 to 11.75

BIRMINGHAM

Per gross ton delivered to consumer:

Hvy. melting steel	$12.50 to $14.00
Scrap steel rails	14.50 to 15.00
Short shov. turnings	7.50 to 8.10
Stove plate	9.00 to 10.00
Steel axles	15.00 to 16.00
Iron axles	15.00 to 16.00
No. 1 RR. wrought	.... 10.00
Rails for rolling	16.00 to 16.50
No. 1 cast	.... 14.50
Tramcar wheels	.... 14.00

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. industrial steel	$11.00 to $11.50
No. 2 hvy. mltng. steel	9.50 to 10.00
Borings and turnings	6.50 to 7.00
Long turnings	6.00 to 6.50
Short shov. turnings	7.00 to 7.50
No. 1 machinery cast	13.50 to 14.00
Automotive cast	13.75 to 14.25
Hvy. breakable cast	10.00 to 10.50
Stove plate	8.00 to 8.50
Hydraul. comp. sheets	12.25 to 12.75
New factory bushel	11.00 to 11.50
Sheet clippings	8.50 to 9.50
Flashings	10.25 to 10.75
Low phos. plate scrap	12.25 to 12.75

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	$11.00 to $11.50
No. 2 hvy. mltng. steel	9.50 to 10.00
Hvy. breakable cast	11.00 to 11.50
No. 1 machinery cast	11.50 to 12.00
No. 2 cast	9.50 to 10.00
Stove plate	9.50 to 10.00
Steel car axles	20.00 to 20.50
Shafting	15.50 to 16.00
No. 1 RR, wrought	11.00 to 11.50
No. 1 wrought long	9.50 to 10.00
Spec. iron & steel pipe	9.00 to 9.50
Rails for rolling	16.00 to 16.50
Clean steel turnings*	4.00 to 4.50
Cast borings*	3.50 to 4.00
No. 1 blast furnace	3.50 to 4.00
Cast borings (chem.)	9.50 to 10.00
Unprepared yard scrap	6.00 to 6.50
Light iron	3.00 to 3.50
Per gross ton, delivered local foundries:	
No. 1 machn. cast†	$13.50 to $14.00
No. 2 cast†	10.50 to 11.00

* $1.50 less for truck loads.
† Northern N. J. prices are $2 to $2.50 higher.

BOSTON

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. steel	Nominal
Scrap rails	Nominal
No. 2 steel	Nominal
Breakable cast	$10.15
Machine shop turn.	$3.38 to $4.15
Mixed bor. & turn.	$2.00 to 2.25
Bun. skeleton long	8.50 to 8.60
Shafting	15.50 to 15.65
Cast bor. chemical	4.50 to 5.00
Per gross ton delivered consumers' yards:	
Textile cast	$12.50 to $14.00
No. 1 machine cast	12.50 to 14.00

PACIFIC COAST

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$12.50 to $14.00
No. 2 hvy. mltng. steel	11.50 to 13.00

CANADA

Dealers' buying prices at their yards, per gross ton:

	Toronto	Montreal
No. 1 hvy. mltng. steel	$9.75	$9.25
No. 2 hvy. mltng. steel	8.25	7.75
Mixed dealers steel	7.00	6.50
Drop forge flashings	9.00	8.50
New loose clippings	4.50	4.00
Busheling	4.25	3.75
Scrap pipe	5.50	5.00
Steel turnings	5.00	4.50
Cast borings	3.75	3.25
Machinery cast	15.00	14.00
Dealers cast	13.00	12.00
Stove plate	11.00	10.00

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges

No. 1 hvy. mltng. steel	$12.00 to $12.50
No. 2 hvy. mltng. steel	10.50 to 11.00
No. 2 cast	10.50 to 11.00
Stove plate	9.50 to 10.00

Boston on cars at Army Base or Mystic Wharf

No. 1 hvy. mltng. steel	$13.50 to $14.00
No. 2 hvy. mltng. steel	12.50 to 13.00
Rails (scrap)	13.50 to 14.00
Mixed textile and machinery cast	12.00

Philadelphia, delivered alongside boats, Port Richmond

No. 1 hvy. mltng. steel	$14.50 to $15.00
No. 2 hvy. mltng. steel	13.50 to 14.00

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

Steel prices on these pages are base prices only and f.o.b. mill unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases the amount of freight which must be absorbed in order to meet competition.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher. F.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods
(No. 5 to 9/32 in.)

	Per Gross Ton
Pittsburgh, Chicago or Cleveland	$43.00
Worcester, Mass.	45.00
Birmingham	43.00
San Francisco	52.00

Rods over 9/32 in. or 47/64 in., inclusive, $5 a ton over base.

SOFT STEEL BARS

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham	2.25c.
Detroit, delivered	2.35c.
Duluth	2.35c.
Philadelphia, delivered	2.57c.
New York	2.59c.
On cars dock Gulf ports	2.60c.
On cars dock Pacific ports	2.85c.

RAIL STEEL BARS

(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.10c.
On cars dock Tex. Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt.	1.90c. to 2.05c.
Detroit, delivered	2.00c. to 2.15c.
On cars dock Tex. Gulf ports	2.25c. to 2.40c.
On cars dock Pacific ports	2.50c.

RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham	1.75c. to 1.90c.
Detroit, delivered	1.85c. to 2.00c.
On cars dock Tex. Gulf ports	2.10c. to 2.25c.
On cars dock Pacific ports	2.35c.

Prices on reinforcing bars have been subject to concessions of $3 a ton or more from above quotations.

IRON BARS

Chicago and Terre Haute	2.15c.
Pittsburgh (refined)	3.60c.

COLD FINISHED BARS AND SHAFTING*

	Base per Lb
Pittsburgh, Buffalo, Cleveland, Chicago and Gary	2.70c.
Detroit	2.75c.

* In quantities of 10,000 to 19,999 lb.

PLATES

	Base per Lb.
Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del.	2.10c.
Philadelphia, del'd	2.15c.
New York, del'd	2.29c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.60c.
Wrought iron plates, P't'g	3.80c.

FLOOR PLATES

Pittsburgh or Chicago	3.35c.
New York, del'd	3.71c.
On cars dock Gulf ports	3.70c.
On cars dock Pacific ports	3.95c.

STRUCTURAL SHAPES

	Base per Lb.
Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham	2.10c.
Philadelphia, del'd	2.215c.
New York, del'd	2.27c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

STEEL SHEET PILING

	Base per Lb.
Pittsburgh, Chicago or Buffalo	2.40c.
On cars dock Gulf ports	.285c.
On cars dock Pacific ports	2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$40.00
Angle bars, per 100 lb.	2.70

F.o.b. Basing Points

Light rails (from billets) per gross ton	$40.00
Light rails (from rail steel) per gross ton	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast ports	2.25c.
Track bolts, to steam railroads	4.15c.
Track bolts to jobbers, all sizes (per 100 counts)	65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon, Pa., Richmond, Va.

SHEETS

Hot Rolled

	Base per Lb.
Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago	2.15c.
Detroit, delivered	2.25c.
Philadelphia, delivered	2.32c.
Granite City	2.25c.
On cars dock Pacific ports	2.65c.
Wrought iron, Pittsburgh	4.25c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago	3.20c.
Detroit, delivered	3.30c.
Granite City	3.30c.
Philadelphia, delivered	3.52c.
On cars dock Pacific ports	3.80c.

* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham	3.50c.
Philadelphia, delv'd	3.67c.
Granite City	3.60c.
On cars dock Pacific ports	4.00c.
Wrought iron Pittsburgh	6.10c.

Electrical Sheets
(*F.o.b. Pittsburgh*)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb

Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary	3.95c.
F.o.b. cars dock Pacific ports	4.65c.

Vitreous Enameling Stock, 20 Gage*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland	3.35c.
Detroit, delv'd	3.45c.
Granite City	3.45c.
On cars dock Pacific ports	3.95c.

TIN MILL PRODUCTS

Tin Plate

	Per Base Box
Standard cokes, Pittsburgh, Chicago and Gary	$5.00
Standard cokes, Granite City	5.10

* Prices effective Nov. 10 on shipments through first quarter of 1939.

Special Coated Manufacturing Ternes

	Per Base Box
Granite City	$4.40
Pittsburgh or Gary	4.30

Roofing Terne Plate
(*F.o.b. Pittsburgh*)

(Per Package, 112 sheets, 20 x 28 in.)	
8-lb. coating I.C.	$12.00
15-lb. coating I.C.	14.00
20-lb. coating I.C.	15.00
25-lb. coating I.C.	16.00
30-lb. coating I.C.	17.25
40-lb. coating I.C.	19.50

Black Plate, 29 gage and lighter

Pittsburgh, Chicago and Gary	3.05c.
Granite City	3.15c.
On cars dock Pacific ports, boxed	4.00c.

HOT ROLLED STRIP

(*Widths up to 12 in.*)

	Base per Lb
Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham	2.15c.
Detroit, delivered	2.25c.

Cooperage Stock

Pittsburgh & Chicago	2.25c.

COLD ROLLED STRIP*

	Base per Lb
Pittsburgh, Youngstown or Cleveland	2.95c.
Chicago	3.05c.
Detroit, delivered	3.05c.
Worcester	3.15c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland	3.10c
Detroit, delivered	3.20c.
Worcester	3.50c.

COLD ROLLED SPRING STEEL

		Pittsburgh and Cleveland	Worcester
Carbon	0.26-0.50%	2.95c.	3.15c.
Carbon	.51 .75	4.30c.	4.50c.
Carbon	.76-1.00	6.15c.	6.35c.
Carbon	1.01 to 1.25	8.35c.	8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade

	Per Lb.
Bright wire	2.60c.
Galvanized wire, base	2.65c.*
Spring wire	3.20c.

* On galvanizing wire to manufacturing trade, size and galvanizing extras are charged, the price Nos. 6 to 9 gage, inclusive, thus being 3.15c.

To the Trade

	Base per Keg
Standard wire nails	$2.45
Coated nails	2.45
Cut nails, carloads	3.60

	Base per 100 Lb.
Annealed fence wire	$2.95
Galvanized fence wire	3.35
Polished staples	3.15
Galvanized staples	3.40
Twisted barbless wire	3.30
Woven wire fence, base column.	67
Single loop bale ties, base col...	56
Stand. 2 pt., 12.5 gage barbed cattle wire, per 80 rod spool..	$2.62
Stand. 2 pt., 12.5 gage barbed hog wire, per 80 rod spool.....	$2.80

Note: Birmingham base same on above items, except spring wire.

Add $4 a ton for Mobile, Ala.; $5 for New Orleans; $6 for Lake Charles to above bases, except on galvanized and annealed merchant fence wire, which are $1 a ton additional in each case.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel In.	Black	Galv.	*Wrought Iron* In.	Black	Galv.
⅛	56	36	¼ & ⅜	.+ 9	+30
¼ to ⅜	.59	43½	½	24	6½
½	.....63½	54	¾	30	13
¾	.....66½	58	1 & 1¼	..34	19
1 to 3	...68½	60½	1½	38	21½
			2	.....37½	21

Lap Weld

2	61	52½	2	.....30½	15
2½ & 3	..64	55½	2½ to 3½	31½	17½
3½ to 6.66		57½	4	.....33½	21
7 & 8	..65	55½	4½ to 8.32½		20
9 & 10	..64½	55	9 to 12	..28½	15
11 & 12	..63½	54			

Butt weld, extra strong, plain ends

⅛	.....54½	41½	¼ & ⅜	.+10	+43
½ to ⅜	.56½	45½	½	25	9
½	.....61½	53½	¾	31	15
¾	.....65½	57½	1 to 2	...38	22½
1 to 3	...67	60			

Lap weld, extra strong, plain ends

2	59	51½	2	.....33½	18½
2½ &	63	55½	2½ to 4.39½		25½
3½ to 6.66½		59	4½ to 6.37½		24
7 & 8	..65½	56	7 & 8	..38½	24½
9 & 10	..64½	55	9 to 12	..32	20½
11 & 12	..63½	54			

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall.

(Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld Hot Rolled
1 in. o.d.....13 B.W.G.	$ 9.01	$ 7.82	....
1¼ in. o.d...13 B.W.G.	10.67	9.26	....
1½ in. o.d...13 B.W.G.	11.70	10.23	$9.72
1⅝ in. o.d...13 B.W.G.	13.42	11.64	11.06
2 in. o.d.....13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d...13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d...12 B.W.G.	18.45	16.01	15.16
2½ in. o.d...12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d...12 B.W.G.	21.42	18.59	17.54
3 in. o.d.....12 B.W.G.	22.46	19.50	18.35
3½ in. o.d...11 B.W.G.	28.37	24.62	23.15
4 in. o.d.....10 B.W.G.	35.20	30.54	28.66
4½ in. o.d...10 B.W.G.	43.04	37.35	35.22
5 in. o.d..... 9 B.W.G.	54.01	46.87	44.25
6 in. o.d..... 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	30%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago.	$51.00
6-in. and larger, del'd New York	49.00
*6-in. and larger, Birmingham.	43.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles....	52.00
F.o.b. dock, Seattle	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles	55.00
F.o.b. dock, Seattle	52.00

Class "A" and gas pipe, $3 extra 4-in. pipe is $3 a ton above 6-in.

Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $42, Birmingham, and $50 delivered Chicago and 4-in. pipe, $45, Birmingham, and $54 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:	
½ in. & 6 in. and smaller....	63½
Larger and longer up to 1 in..	66
1⅛ in. and larger.....	64
Lag bolts	66
Plow bolts, Nos. 1, 2, 3 and 7	63½
Hot pressed nuts, and c.p.c. and t-nuts, square or hex. blank or tapped:	
½ in. and smaller.....	67
9/16 in. to 1 in. inclusive.....	64
1⅛ in. and larger	62

On the above items with the exception of plow bolts, there is an additional allowance of 10 per cent for full container quantities.

On all of the above items, there is an additional 5 per cent allowance for carload shipments.

	U.S.S.	S.A.E.
Semi-fin. hexagon nuts		
½ in. and smaller	67	70
9/16 to 1 in.	64	65
1⅛ in. and larger.....	62	62

In full container lots, 10 per cent additional discount.

Stove bolts in packages, nuts attached	72½
Stove bolts in packages, with nuts separate	72½ and 12½
Stove bolts in bulk	84

On stove bolts freight is allowed to destination on 200 lb. and over.

Large Rivets

(½ in. and larger)

Base Per 100 Lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham $3.40

Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham ....65 and 10

Cap and Set Screws

(Freight allowed to destination)

Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller.....50 and	10
Milled square head set screws, case hardened, 1 in. dia. and smaller .....73 and	10
Milled headless set screws, cut thread ¾ in. and smaller..68 and	10
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	67½
Upset set screws, cup and oval points	75
Milled studs	60

Alloy and Stainless Steel

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem. Base price, $56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade, base	2.80c.
Delivered, Detroit	2.90c.
S.A.E. Series Numbers	Alloy Differential per 100 Lb.
200 (½% Nickel).....	$0.35
2100 (1½% Nickel)	$0.75
2300 (3½% Nickel)	1.55
2500 (5% Nickel)	2.25
3100 Nickel-chromium	0.70
3200 Nickel-chromium	1.85
3300 Nickel-chromium	3.80
3400 Nickel-chromium	3.20
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum)	0.55
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum)	0.75
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.)	1.10
5100 Chrome steel (0.60-090 Cr.)	0.35
5100 Chrome steel (0.80-1.10 Cr.)	0.45
5100 Chromium spring steel.....	0.15
6100 Chromium-vanadium bar ..	1.20
6100 Chromium-vanadium spring steel	0.85
Chromium-nickel vanadium	1.50
Carbon-vanadium	0.85

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.40c. base per lb. Delivered Detroit, 3.50c., carlots.

CORROSION & HEAT RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chrome-Nickel

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25c.	24c.
Plates	29c.	27c.
Structural shapes.	25c.	24c.
Sheets	36c.	34c.
Hot-rolled strip ..	23.50c.	21.50c.
Cold-rolled strip ..	30c.	28c.
Drawn wire	25c.	24c.

Straight Chrome

	No. 410	No. 430	No. 442	No. 446
Bars	.18.50c.	19c.	22.50c.	27.50c.
Plates	21.50c.	22c.	25.50c.	30.50c.
Sheets	26.50c.	29c.	32.50c.	36.50c.
Hot Strip	17c.	17.50c.	23c.	28c.
Cold stp.	22c.	22.50c.	28.50c.	36.50c.

TOOL STEEL

High speed	67c.
High-carbon-chrome	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

British and Continental

BRITISH

Per Gross Ton f.o.b. United Kingdom Ports

Ferromanganese, export	Nominal
Tin plate, per base box.....	20s. 3d.
Steel bars, open hearth.	£10 8s.
Beams, open-hearth	£10
Channels, open-hearth ..	£10 5s.
Angles, open-hearth	£10
Black sheets, No. 24 gage.	£13
Galvanized sheets, No .24 gage	£15 15s.

CONTINENTAL

Per Gross Ton, Gold £, f.o.b. Continental Ports

Billets, Thomas	Nominal
Wire rods, No. 5 B.W.G..	£5 10s.
Steel bars, merchant	£5 5s.
Sheet bars	Nominal
Plate ¼ in. and up.....	£5 7s.
Plate 3/16 in. and 5 mm..	£5 13s.
Sheets ⅛ in.	£5 9s. 6d.
Beams, Thomas	£4 18s.
Angles (Basic)	£4 18s.
Hoops and strip, base	£5 12s.

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	$22.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	22.00
Delivered Brooklyn	24.50
Delivered Newark or Jersey City	23.53
Delivered Philadelphia	22.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	21.00
F.o.b. Buffalo	21.00
F.o.b. Detroit	21.00
Southern, delivered Cincinnati	21.06
Northern, delivered, Cincinnati	21.44
F.o.b. Duluth	21.50
F.o.b. Provo, Utah	19.00
Delivered, San Francisco, Los Angeles or Seattle	24.50
F.o.b. Birmingham*	17.38

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	$21.50
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	21.50
F.o.b. Buffalo	20.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	20.50
Delivered Philadelphia	22.34
Delivered Canton, Ohio	21.89
Delivered Mansfield, Ohio	22.44
F.o.b. Birmingham	16.00

Bessemer

F.o.b. Buffalo	$22.00
F.o.b. Everett, Mass.	23.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	23.00
Delivered Newark or Jersey City	24.53
Erie, Pa., and Duluth	22.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown	21.50
F.o.b. Birmingham	22.00
Delivered Cincinnati	22.11
Delivered Canton, Ohio	22.89
Delivered Mansfield, Ohio	23.44

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.	26.50

Gray Forge

Valley or Pittsburgh furnace	$20.50

Charcoal

Lake Superior furnace	$25.00
Delivered Chicago	28.34

Canadian Pig Iron

Per Gross Ton

Montreal

Foundry iron	$24.50	base
Malleable	25.00	base
Basic	24.50	base

Toronto

Foundry iron	$22.50	base
Malleable	23.00	base
Basic	22.50	base

On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload) $80.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	$28.00
Domestic, 26 to 28%	33.00

Electric Ferrosilicon

Per Gross Ton Delivered; Lump Size

50% (carload lots, bulk)	$69.50*
50% (ton lots in 50 gal. bbl.)	80.50*
75% (carload lots, bulk)	126.00*
75% (ton lots in 50 gal. bbl.)	139.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio

Per Gross Ton

10.00 to 10.50% $30.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2%, $1 per ton additional. Phosphorus 0.75% or over, $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 500 to 5.50% $24.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton. The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots, Lump Size, on Contract

4 to 6% carbon	10.50c.*
2% carbon	16.50c.*
1% carbon	17.50c.*
0.10% carbon	19.50c.*
0.06 carbon	20.00c.*

Silico-manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon	$83.00
2.50% carbon	88.00
2% carbon	93.00
1% carbon	103.00

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carloads	$1.75
Ferrotungsten. 100 lbs. and less	2.00
Ferrovanadium, contract, per lb. contained V., delivered	$2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., tons lots	$2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton	$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton	$157.50
Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic, 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville	$75.00
Ferromolybdenum, per lb. Mo. f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo. f.o.b. furnace	80c.

* Spot prices are $5 per ton higher.
† Spot prices are 10c. per lb. of contained element higher.

ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, Bessemer, 51.50%	$5.25
Old range, non-Bessemer, 51.50%	5.10
Messabi, Bessemer, 51.50%	5.10
Messabi, non-Bessemer, 51.50%	4.95
High phosphorus, 51.50%	4.85

Foreign Ore

C.i.f. Philadelphia or Baltimore

Per Unit

Iron, low phos., copper free, 55 to 58% dry, Algeria	12c.
Iron, low phos., Swedish, aver age, 68½% iron	12c.
Iron, basic or foundry, Swedish, aver. 65% iron	11c.
Iron, basic or foundry, Russian, aver. 65% iron	Nominal
Man., Caucasian, washed 52%	28c.
Man., African, Indian, 44-48%	25c.
Man., African, Indian, 49-51%	28c.
Man., Brazilian, 46 to 48%	27c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered	$18.50
Tungsten, domestic, scheelite delivered	$16.00 to $18.00
Chrome ore (lump) c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)	$15.00
Rhodesian, 45%	19.00
Rhodesian, 48%	22.50
Turkish, 48-49%	22.50
Turkish, 45-46%	19.00
Turkish, 40-44%	17.00
Chrome concentrates (Turkish) c.i.f. Atlantic Seaboard, per gross ton: 50%	$25.00
48-49%	23.50

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$17.00 to $18.00
Domestic, f.o.b. Ohio River landing barges	18.00
No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines	18.00
Foreign, 85% calcium, fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	21.50
Domestic No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	31.50

FUEL OIL

Per Gal.

No. 2, f.o.b. Bayonne	3.75c.
No. 6, f.o.b. Bayonne	2.26c.
No. 5 Bur. Stds., del'd Chicago.	3.25c.
No. 6 Bur. Stds., del'd Chicago.	2.75c.
No. 3 distillate, del'd Cleve'd.	5.50c.
No. 4 industrial, del'd Cleve'd.	5.25c.
No. 5 industrial, del'd Cleve'd.	3.00c.
No. 6 industrial, del'd Cleve'd.	2.75c.

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, Prompt	$3.75
Furnace, f.o.b. Connellsville, Prompt	$4.75 to 5.50
Foundry, by - product, Chicago ovens	10.25
Foundry, by-product, del'd New England	12.50
Foundry, by-product, del'd Newark or Jersey City	10.88 to 11.40
Foundry, by-product, Philadelphia	10.95
Foundry, by-product, delivered Cleveland	10.30
Foundry, by-product, delivered Cincinnati	9.75
Foundry, Birmingham	7.50
Foundry, by-product, del'd St. Louis industrial district	10.75 to 11.00
Foundry, from Birmingham, f.o.b. cars dock Pacific ports	14.75

IRON AND STEEL WAREHOUSE PRICES

PITTSBURGH*

	Base per Lb.
Plates	3.55c.
Shapes	3.55c.
Soft steel bars and small shapes	3.60c.
**Reinforcing steel bars	2.70c.
Cold finished bars and screw stock	3.70c.
Hot rolled strip	3.75c.
Hot rolled sheets	3.50c.
Galv. sheets (24 ga.) 500 lb. to 1499 lb.	4.50c.
Wire, black, soft annealed	3.15c.
Wire, galv., soft	3.55c.
Track spikes (1 to 24 kegs)	3.60c.
Wire nails (in 100-lb. kegs)	2.65c.

On plates, structurals, bars, strip and hot rolled sheets, base applied to orders of 400 to 1999 lb.
** On reinforcing bars base applies to orders of less than one ton and includes switching and carting charge.
* All above prices for delivery within the Pittsburgh switching district.

NEW YORK

	Base per Lb.
Plates, ¼ in. and heavier	3.76c.
Structural shapes	3.75c.
Soft steel bars, round	3.94c.
Iron bars, Swed. charcoal	7.50 to 8.25c
Cold-fin, shafting and screw stock:	
Rounds, squares, hexagons	4.14c.
Flats up to 12 in. wide	4.14c.
Cold-rolled strip, soft and quarter hard	3.66c.
Hot-rolled strip, soft O.H.	4.11c.
*Hot-rolled sheets (8-30 ga.)	3.40c.
Galv. sheets (24 ga.)	4.50c.
Long ternes (24 ga.)	5.50 to 6.20c.
Cold-rolled sheets (20 ga.)	
Standard quality	4.60c.
Deep drawing	4.85c.
Stretcher leveled	5.10c.
SAE, 2300, hot-rolled	7.50c.
SAE, 3100, hot-rolled	6.10c.
SAE, 6100, hot-rolled annealed	10.25c.
SAE, 2300, cold-rolled	8.69c.
SAE, 3100, cold-rolled, annealed	7.29c.
Floor plate, ⅛ in. and heavier	5.43c.
Standard tool steel	12.50c.
Wire, black, annealed (No. 9)	4.65c.
Wire, galv. (No. 9)	5.00c.
Open-hearth spring steel	4.75c. to 10.25c.
Common wire nails, per keg in 25 keg lots	$2.90

*For lots less than 2000 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.55c.
Soft steel bars, rounds and angles	3.60c.
Soft steel squares, hexagons, channels and Tees	3.75c.
Hot rolled strip	3.75c.
Floor plates	5.15c.
Hot rolled sheets	3.50c.
Galvanized sheets	4.50c.
Cold rolled sheets	4.45c.
Cold finished carbon bars	4.05c.

Above prices are subject to deductions and extras for quantity and are f.o.b. consumer's plant within Chicago free delivery zone.

CLEVELAND

	Base per Lb.
Plates	3.55c.
Structural shapes	3.73c.
Soft steel bars	3.50c.
Reinfor. bars (under 2000 lb.)†	2.55c.
Cold-fin. bars (1000 lb., over)	3.80c.
Hot-rolled strip	3.65c.
Cold rolled sheets	4.70c.
Cold-finished strip	3.35c.
Galvanized sheets (No. 24)	4.62c.
Hot-rolled sheets	3.50c.
Floor plates, 3/16 in. and heavier	5.33c.
*Black ann'l'd wire, per 100 lb.	$3.10
*No. 9 galv. wire, per 100 lb.	3.50
*Com. wire nails, base per keg	2.60
Hot rolled alloy steel (3100)	6.05c.
Cold rolled alloy steel (3115)	6.85c.

* For 5000 lb. or less.
† 500 lb. base quantity.

Prices shown on hot rolled bars, strip, sheets, shapes and plates are for 400 to 1999 lb. Alloy steel, 1000 lb. and over; galvanized sheets, 150 to 1499 lb.; cold rolled sheets, 399 lb. and under.

ST. LOUIS

	Base per Lb.
Plates and structural shapes	3.82c.
Bars, soft steel (rounds and flats)	3.87c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	4.02c.
Cold fin. rounds, shafting, screw stock	4.32c.
Galv. sheets (24 ga.)	4.77c.
Hot rolled sheets	3.77c.
Galv. corrugated sheets, 24 ga. and heavier*	4.82c.
Structural rivets	5.02c.

* No. 26 and lighter take special prices.

BOSTON

	Base per Lb.
Structural shapes, 3 in. and larger	5.85c.
Plates, ¼ in. and heavier	3.85c.
Bars	3.98c.
Heavy hot rolled sheets	3.86c.
Hot rolled sheets	4.21c.
Hot rolled annealed sheets	4.76c.
Galvanized sheets	4.76c.
Cold rolled sheets	4.93c.

The following quantity differentials apply: Less than 100 lb., plus $1.50 per 100 lb.; 100 to 399 lb. plus 50c.; 400 to 1999 lb. base; 2000 to 9999 lb. minus 20c.; 10,000 to 39,999 lb. minus 30c.; 40,000 lb. and over minus 40c.

BUFFALO

Plates	3.77c.
Floor plates	5.40c.
Struc. shapes	3.55c.
Soft steel bars	3.60c.
Reinforcing bars (20,000 lb. or more)	2.05c.
Cold-fin. flats, squares, rounds, and hex.	3.80
Hot-rolled sheets, 3/16 x 14 in. to 48 in. wide incl. also sizes No. 8 to 30 ga.	3.50c.
Galv. sheets (24 ga.)	4.50c.
Bands and hoops	3.97c.

NEW ORLEANS

	Base per Lb.
Mild steel bars	4.20c.
Reinforcing bars	3.24c.
Structural shapes	4.10c.
Plates	4.10c.
Hot-rolled sheets, No. 10	4.35c.
Steel bands	4.75c.
Cold-finished steel bars	5.10c.
Structural rivets	4.85c.
Boiler rivets	4.85c.
Common wire nails, base per keg	3.55
Bolts and nuts, per cent off list	60

REFRACTORIES PRICES

Fire Clay Brick

	Per 1000 f.o.b. Works
Super-duty brick, at St. Louis	$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1, Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$40.00
Chicago District	49.00
Birmingham	40.00
Silica cement per net ton (Eastern)	8.55

Chrome Brick

	Net per Ton
Standard f.o.b. Baltimore, Plymouth Meeting and Chester	$47.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	47.00

Magnesite Brick

	Net per Ton
Standard f.o.b. Baltimore and Chester	$67.00
Chemically bonded, f.o.b. Baltimore	57.00

Grain Magnesite

	Net per Ton
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	$45.00
Domestic, f.o.b. Baltimore and Chester, in sacks	40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	3.40c.
*Structural shapes	3.40c.
*Soft steel bars, small shapes, iron bars (except bands)	3.60c.
‡Reinforc. steel bars, square and deformed	2.61c.
Cold-finished steel bars	4.11c.
*Steel hoops	4.10c.
*Steel bands, No. 12 and 3/16 in. incl.	3.60c.
*Spring steel	4.75c.
†Hot-rolled anneal. sheets	3.40c.
†Galvanized sheets (No. 24)	4.33c.
*Diam. pat. floor plates, ¼ in.	5.00c.

These prices are for delivery in Philadelphia trucking area.
*Base prices subject to deduction on orders aggregating 4000 lb. or over
†For 25 bundles or over.
‡For one to five tons.

BIRMINGHAM

Bars and bar shapes	$3.85 base	
Structural shapes and plates	3.75 "	
Hot rolled sheets No. 10 ga.	3.80 "	
Hot rolled sheets No. 24 ga.	4.40 "	3500 lb. and over
Galvanized sheets No. 24 ga.	5.05 "	3500 lb. or more
Strip	4.05 "	
Reinforcing bars.	3.85 "	
Floor plates	5.96 "	
Cold finished bars	4.91 "	
Machine and carriage bolts	.50 & 10 off list	
Rivets (structural)	$4.60 base	

On plates, shapes, bars, hot-rolled strip heavy hot-rolled sheets, the base applies on 400 to 3999 lb. All prices are f.o.b. consumer's plant.

PACIFIC COAST

	Base per Lb. San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	4.00c.	4.00c.	4.05c.
Shapes, standard	4.00c.	4.00c.	4.05c.
Soft steel bars	4.05c.	4.00c.	4.30c.
Reinforcing bars, f.o.b. cars dock Pacific ports	2.675c.	open.	2.975c.
Hot-rolled sheets (No. 10)	4.00c.	4.20c.	3.95c.
Galv. sheets (No. 24 and lighter)	5.00c.	4.75c.	5.25c.
Galv. sheets (No. 22 and heavier)	5.25c.	4.75c.	5.25c.
Cold-finished steel Rounds	6.55c.	6.60c.	7.10c.
Squares and hexagons	7.80c.	7.85c.	7.10c.
Flats	8.30c.	8.35c.	8.10c.
Common wire nails—base per keg less carload	$3.20	$3.00	$3.00

All items subject to differentials for quantity.

ST. PAUL

	Base per Lb.
Mild steel bars, rounds	4.10c.
Structural shapes	4.00c.
Plates	4.00c.
Cold-finished bars	4.83c.
Hot-rolled annealed sheets, No. 24	4.75c.
Galvanized sheets, No. 24	5.00c.

On mild steel bars, shapes and plates the base applies on 400 to 14,999 lb. On hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over. Base on cold-finished bars is 1000 lb. and over of a size.

DETROIT

	Base per Lb.
Soft steel bars	3.43c.
Structural shapes	3.80c.
Plates	3.75c.
Floor plates	5.42c.
Hot-rolled sheets, 8 to 30 gages above 12 in. and 3/16 in., 24 in. to 48 in. wide	3.58c.
Cold-rolled sheets	4.65c.
Galvanized sheets	4.74c.
Hot-rolled strip, under No. 12	3.83c.
Hot-rolled strip, No. 12 and over	3.58c.
Cold-finished bars	3.60c.
Cold-rolled strip	3.55c.
Hot-rolled alloy steel (SAE 3100 Series)	6.17c.

Quantity extras apply to all items.

PLANT EXPANSION AND EQUIPMENT BUYING

NORTH ATLANTIC

General Foods Corp., 250 Park Avenue, New York, has let general contract to H. K. Ferguson Co., Cleveland, for four-story addition to branch plant at Hoboken, N. J., about 100,000 sq. ft. of floor space, for tin can and container manufacture for coffee products. Cost about $250,000 with equipment.

Electro-Motive Mfg. Co., Inc., 797 East 140th Street, New York, manufacturer of radio parts and equipment, has leased 30,000 sq. ft. floor space, in former mill of Rossie Velvet Co., Willimantic, Conn., and will improve for plant. Entire business will be removed to new location and production increased.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 4 for 3420 fuse indicators (Schedule 5917), non-metallic gasoline hose, 1¼ in. i.d., with couplings (Schedule 5887); until April 11, one or two heavy-duty, motor-driven, open side convertible, reversing planers, and special tool heads (Schedule 5932) for Brooklyn Navy Yard; until April 4, copper-nickel alloy tubing (Schedule 5893); until April 7, 126 hydraulically-operated valves, with spare parts (Schedule 5897); until April 11, water and airtight, quick-operating doors, complete (Schedule 5884), for Brooklyn and Philadelphia yards; about 18,000 ft. of flexible bronze steam hose (Schedule 5866) for Brooklyn and Mare Island yards.

National Biscuit Co., 449 West Fourteenth Street, New York, has purchased about 35 acres at Murphy and Arden Avenues, Atlanta, Ga., for new branch baking, storage and distributing plant. Main unit will be one-story, 300 x 900 ft., with auxiliary structures, for straight-line production, with band-type oven units, conveyors, mixing machinery, loaders and other mechanical equipment. Work is scheduled to begin in 90 days. Cost about $2,000,000, of which over one-half will be expended for equipment. Louis Wirsching is company architect and engineer, first noted address.

Pneumatic Tool Sales & Repair Co., 136 West Fifty-fourth Street, New York, has leased two-story industrial building at 14-29 Thirty-third Avenue, Long Island City, for new plant for parts production, service and repairs.

Commanding Officer, Ordnance Department, Watervliet Arsenal, Watervliet, N. Y., asks bids until April 11 for adjustable gages (Circular 162); until April 18, one hydraulic horizontal broaching machine (Circular 170).

Bureau of Yards and Docks, Navy Department, Washington, has begun expansion and improvements in Brooklyn Navy Yard, to include enlargement of shipways, buildings and other structures. Cost over $1,500,000 with equipment. A similar program will be carried out at Philadelphia Navy Yard, to cost approximately a like amount.

Popper Machine Corp., 37 West Twenty-eighth Street, New York, manufacturer of parts for sewing machines, etc., has leased space in building at 133 Mercer Street, for plant.

Quartermaster, West Point, N. Y., asks bids until April 5 for cast iron manhole frames and covers, cast iron circular frames and covers, cast iron circular frames and grating covers, cast iron catch basin frames and crates (Circular 955-59).

Azor Corp., 24 Commerce Street, Newark, N. J., manufacturer of metallic gaskets and other metal specialties, has leased one-story building at 107-109 Montgomery Avenue, Irvington district, for plant, removing present works to new location and expanding capacity.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until April 6 for 28 pneumatic staking machines, each with 6000-lb. capacity, at 80-lb. air pressure, and for 10 similar machines with 20,000 lb. capacity at 85-lb. air pressure (Circular 620).

Bureau of Yards and Docks, Navy Department, Washington, plans new aeronautical engineering laboratory at naval aircraft factory, Philadelphia. Appropriation of $1,800,000 is being arranged for building and equipment. Also will build several one-story storage and distributing buildings at Marine Corps supply depot, cost $1,300,000 with equipment; and one-story addition to projectile loading plant at ammunition depot, Fort Mifflin, Pa., to cost about $45,000. Appropriations for latter projects will be available soon.

Commanding Officer, Ordnance Department, Frankford Arsenal, Philadelphia, asks bids until April 4 for two motor-driven vertical single-spindle wood boring machines (Circular 889); also 24 motor drives on 0.50 cal. vertical presses (Circular 874).

BUFFALO DISTRICT

Hooker Electrochemical Co., Buffalo Avenue and Forty-seventh Street, Niagara Falls, N. Y., industrial chemicals, has let general contract to C. C. Bremer & Co., 2576 Seneca Avenue, for one-story addition. Cost over $85,000 with equipment. W. Alban Cannon, 2637 Main Street, is architect.

United States Engineer Office, Federal Building, Buffalo, asks bids until April 3 for one electric motor, marine type (Circular 117).

Niagara Hudson Power Corp., Electric Building, Buffalo, has authorized an appropriation of about $25,000,000 for expansion and improvements this year, including generating stations, transmissions and distributing lines, power substations and other structures. Of this amount about $8,000,000 will be expended by Central New York Power Corp., Ithaca, N. Y., a subsidiary, on new steam-electric generating station at Oswego, N. Y., on which work was begun recently.

NEW ENGLAND

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until April 4 for side milling cutters end mills, form shank cutters, shank cutters, high-speed steel mills, hollow-mills, reamers and countersinks (Circular 355); until April 5, two motor-driven automatic small milling machines (Circular 352); until April 7, one motor-driven cylinder and cone grinder, cam feed (Circular 362), one plain automatic milling machine (Circular 351); until April 10, gages, including snap, plug, location, flush pin, etc. (Circular 326); until April 11, small automatic motor-driven milling machine (Circular 364; until April 12, one broaching machine, with fixture, and 12 circular broaches (Circular 341).

Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford, Conn., has let general contract to James Stewart & Co., 230 Park Avenue, New York, for new plant on 120-acre tract at West Hartford, comprising main one-story unit, 520 x 960 ft., and adjoining two-story structure, 150 x 242 ft. Cost close to $2,000,000 with equipment. Albert Kahn, Inc., Detroit, is architect and engineer.

WASHINGTON DIST.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for pumps, deaerating feed water heaters and auxiliary equipment for power plant at naval torpedo station, Newport, R. I. (Specifications 9108); also bids (no closing date stated) for combustion control equipment for power plants at Newport station and Boston Navy Yard (Specifications 9120). Plans will be prepared soon for one-story aircraft building for storage and distribution at Coco Solo fleet air base, to cost $285,000 with equipment; also for additional magazine buildings and auxiliary structures at ammunition depot, Oahu, H. I., to cost $233,500 with equipment. Appropriations are being arranged.

Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md., asks bids until April 12 for grit blast machine with dust arrestor equipment and air compressor (Circular 1).

General Purchasing Officer, Panama Canal, Washington, asks bids until April 3 for one heavy-duty concrete mixer, 28 cu. ft. capacity, 5000 lb. of track bolts, twist drills, bolt dies, split dies, hand taps, augur bits, ship augurs, machine bits, bridge reamers, files, wrenches, etc., gasoline engine-driven industrial tractor, with cab (Schedule 3436); until April 5, galvanized steel wire finishing nails, galvanized boat spikes, cut copper nails, pipe sleeving, electric-operated sump pump, 30-hp. boiler (Schedule 3437).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 4 for copper-nickel-alloy tubing (Schedule 5846), eight electric-driven winches, with electric brakes and controllers and electrical spare parts (Schedule 5823) for Boston, Charleston and Puget Sound Navy yards; until April 4, motor-driven grinder (Schedule 5898) for Washington yard; motor-driven grinder with tools and equipment (Schedule 5856); until April 7, motor-driven profiler and equipment (Schedule 5915) for Alexandria, Va., yard; hydraulic pipe-bending machine (Schedule 5904) for Norfolk yard.

SOUTH ATLANTIC

Standard Oil Co., 746 Marietta Street, N. W., Atlanta, Ga., has low bid from Edward P. Ansley, Walton Building, for new bulk oil storage and distributing plant at Americus, Ga. Cost over $50,000 with equipment.

Rosa Co., Homerville, Ga., manufacturer of naval stores, plans rebuilding part of plant recently destroyed by fire. Loss about $45,000, including steam still unit and other structures.

Halifax Paper Co., Roanoke Rapids, N. C., manufacturer of kraft wrapping papers, etc., has let general contract to Southeastern Construction Co., 218 West Second Street, Charlotte, N. C., for one-story addition. Cost over $50,000 with equipment. J. E. Sirrine & Co., Greenville, S. C., are consulting engineers.

SOUTHWEST

Missouri-Pacific Railroad Co., Missouri-Pacific Building, St. Louis, has let general contract to J. S. Alberici, Boatmen's Bank Building, for one-story addition to engine house and shops on Chouteau Avenue. Cost about $50,000 with equipment. F. E. Bates is chief engineer, address noted.

ABC Brewing Co., 2825 South Broadway, St. Louis, recently organized, has taken over brewery at location noted and plans expansion and improvements, including additional equipment. Cost close to $45,000. Louis Kanne is president.

Friesen Grain Co., Cheney, Kan., has let general contract to Chalmers & Borton Co., 28 East First Street, Hutchinson, Kan., for new grain elevator with about 60-000-bu. capacity. Cost close to $50,000 with elevating, conveying, screening and other equipment.

Chickasha Cotton Oil Co., Chickasha, Okla., has acquired about 20 acres at Muleshoe, Tex., for new branch mill, comprising main one-story unit, and smaller buildings. Cost about $60,000 with equipment.

Purchasing and Contracting Officer, Normoyle Quartermaster Depot, San Antonio, Tex., asks bids until April 12 for one electric drill, electric indicator, wrist pin bushing grinder with mandrels, hydraulic body fender and frame jack, and other equipment (Circular 632-7).

San Antonio Brewing Association, 312 James Street, San Antonio, Tex., asks bids until April 3 on general contract for one-

story addition, 130 x 220 ft. Cost close to $100,000 with equipment. Adams & Adams, Insurance Building, are architects; W. E. Simpson, Milan Building, is consulting engineer.

Signal Officer, Fort Sam Houston, Tex., asks bids until April 3 for one air compressor and one exhaust unit (Circular 11).

WESTERN PA. DIST.

Purchasing and Contracting Officer, Quartermaster Corps, West Virginia District, CCC, Charleston, W. Va., asks bids until April 3 for copper wire, bolts, screws, washers, switches, cable connectors, lightning arrestors and other equipment (Circular 5505-25).

United States Bureau of Mines, Department of Interior, 4800 Forbes Street, Pittsburgh, has let general contract to B. L. Winner Co., Inc., 2440 Maple Avenue, for one-story engineering shop and laboratory. Cost about $150,000 exclusive of equipment.

SOUTH CENTRAL

Ingalls Iron Works Co., Inc., Birmingham, has work under way on modernizing plant of International Shipbuilding Co., Pascagoula, Miss., idle for several years and recently acquired in agreement with Port Commission and City Council of that place for new shipbuilding plant. Three new shipways will be built to accommodate vessels 500 ft. long; several one-story buildings will be erected, including mold loft unit, fabricating shop, forge and blacksmith shop, with crane runways and other facilities. Yard occupies about 44 acres and is scheduled to be ready for service late in spring. Cost over $150,000 with equipment. Doullut & Ewin, Inc., Physicians' & Surgeons' Building, New Orleans, has award for building foundations and other work.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until April 10 for pneumatic conveying system with approximate capacity of 25 tons of dry phosphate rock per hour, for installation at Wilson Dam, Ala., properties.

Feliciana Starch Co., Carondelet Building, New Orleans, will take bids soon on general contract and equipment for new plant at St. Francisville, La. It will comprise a main one-story unit and auxiliary buildings, installation to include electric washers, separators, filters, tanks and other equipment. Cost over $65,000 with equipment. Douglas M. Warriner, 6315 Delord Street, New Orleans, is consulting engineer.

OHIO AND INDIANA

Toledo Scale Mfg. Co., 3216 Monroe Street, Toledo, Ohio, has filed plans for one and multi-story addition, about 120 x 440 ft., and will begin superstructure at once. Cost close to $450,000 with equipment.

Quartermaster Supply Officer, Columbus General Depot, Columbus, Ohio, asks bids until April 3 for one motor-driven bench saw, without motor, one motor-driven combination saw bench with attachments, 20-in. planer, 30-in. bandsaw, combination drum and disk-type sanding machine, power hacksaw, automatic air compressor, drill, all motor-driven (Circular 214-4).

Sterling Faucet Co., Newcomerstown, Ohio, manufacturer of plumbers' brass goods, plans rebuilding part of plant recently destroyed by fire. Loss close to $100,000 with equipment.

Ferro Enamel Corp., 4150 East Fifty-sixth Street, Cleveland, manufacturer of enameling furnace equipment, enamel frit, etc., has let general contract to Mooney Iron Works Co., 3319 East Eightieth Street, for two one-story additions, about 15,000 sq. ft. of floor space. Cost over $60,000 with equipment.

Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until April 4 for 1050 propeller spinner adapter assemblies (Circular 832).

Board of Education, Toledo, Ohio, has let general contract to H. J. Spieker Co., 1418 Elm Street, for two-story vocational high school at Sixteenth, Seventeenth and Washington Streets, at $317,000 exclusive of equipment. Edwin M. Gee, Administration Building, 121 Southard Avenue, is architect for board.

Board of Public Works, Rensselaer, Ind., will take bids soon for expansion and improvements in municipal electric power plant. Cost close to $50,000 with equipment. John W. Moore & Son, Indiana Pythian Building, Indianapolis, are consulting engineers.

Board of School Trustees, Administration Building, South Bend, Ind., plans manual training department in new two-story and basement East Side high school at Twykenham Drive and Mishawaka Street, for which general contract has been let to Peter Schumacher & Son, 321 West Sixth Street, Mishawaka, Ind. Cost about $665,000. Maurer & Maurer, 107 Lincolnway East, South Bend, are architects; Bevington-Williams, Inc., Indiana Pythian Building, Indianapolis, is mechanical engineer.

MIDDLE WEST

Winnebago Distillery Co., 105 West Monroe Street, Chicago, is asking bids on general contract, to close about April 15, for new plant on State Highway No. 25, near Elgin, Ill., consisting of about 12 one-story buildings, with one eight-story bulk storage and distributing unit and a power house. Cost close to $700,000 with equipment. Paul Gerhardt, Sr., 457 West Fullerton Street, Chicago, is architect.

Procter & Gamble Mfg. Co., 1232 West North Avenue, Chicago, soaps, washing powders, edible oils, etc., has let general contract to Sill Construction Co., 520 North Michigan Avenue, for two-story and basement addition, 100 x 200 ft., on North Magnolia Avenue. Cost about $150,000 with equipment. Jensen & Teutsch, 1105 West Lawrence Avenue, are architects. Main offices are in Cincinnati.

Bureau of Reclamation, Denver, asks bids until April 6 for one 10 ft. x 11 ft. radial gate and one 3600-lb. double-drum radial-gate hoist for South Eaglenest siphon, Heart Mountain Canal, Heart Mountain division, Shoshone project, Wyo. (Specifications 1208-D).

Town Council, Renwick, Iowa, asks bids until April 10 for extensions and improvements in municipal electric power plant, including 260 to 300-hp. diesel engine-generator unit and auxiliary equipment, with switchboard and other apparatus. Young & Stanley, Inc., Muscatine, Iowa, is consulting engineer.

C. E. Niehoff & Co., 230 West Superior Street, Chicago, manufacturers of automobile ignition equipment, etc., have started construction on new one-story plant, 90 x 220 ft., on Lawrence Avenue. Cost close to $75,000 with equipment. Edward M. Sieja, 4137 West Barry Avenue, is architect; Holton Seeley Co., 32 West Randolph Street, is contractor.

Town Council, Sumner, Iowa, asks bids until April 12 for extensions and improvements in municipal electric power plant, including new 375-bhp. diesel engine-generator unit, exciter and auxiliary equipment, exhaust and cooling equipment, piping, switchboard and accessories. Ralph W. Gearhart, 349 Twenty-first Street, S. E., Cedar Rapids, Iowa, is consulting engineer.

MICHIGAN DISTRICT

Divco-Twin Truck Co., 12801 East Jefferson Avenue, Detroit, small motor trucks and parts, has let general contract to W. E. Wood Co., 4649 Humboldt Street, for new one-story and basement plant, 250 x 500 ft., on Hoover Road, Macomb County, including power house and auxiliary structures. Plant will be used for both parts production and assembling. Cost about $250,000 with equipment. Smith, Hinchman & Grylls, Marquette Building, are architects and engineers.

City Council, Flint, Mich., has approved plans for three-story addition to steel hangar at Bishop municipal airport. Cost about $103,000. Financing has been arranged through Federal aid.

King-Seeley Corp., Detroit Avenue, Ann Arbor, Mich., manufacturer of oil gages, fuel pumps and other liquid-measuring equipment, has let general contract to W. E. Wood Co., 4649 Humboldt Street, Detroit, for five-story addition, 65 x 120 ft., for expansion in parts production and assembling divisions, with part reserved for office. Cost over $125,000 with equipment. Giffels & Vallet, Inc., Marquette Building, Detroit, is architect and engineer.

PACIFIC COAST

Ryan Aeronautical Co., Lindbergh Field, San Diego, Cal., airplanes and parts, plans new two-story hangar, shop and aviation instruction school building, 200 x 300 ft., near local air base of United States Coast Guard. Cost about $100,000 with equipment.

Bureau of Yards and Docks. Navy Department, Washington, plans new graving dry dock, with mechanical and operating equipment and accessories at Mare Island Navy Yard, to cost $1,750,000; also new utility and service shops and transportation building at same yard, cost about $100,000 with equipment; laboratory building with equipment, $120,000. Appropriations are being secured in amounts noted.

Swift & Co., Seattle, meat packers, plan new one and multi-story plant for processing and packing at Fourth Street South and Connecticut Avenue, 150 x 320 ft. Cost about $250,000 with equipment. Site of present plant of company is to be used for new terminal post office. W. G. Young is local manager. Main offices are in Chicago.

Bureau of Reclamation, Denver, asks bids until April 5 for two 10 ft. x 6 ft. radial gates; one 12 ft. x 12 ft. radial gate; two hand-operated, 2300-lb. double-thread worm, double-drum radial gate hoists; one 7500-lb. hand-operated, single-thread worm, double-drum, radial-gate hoist, all for diversion dam, Duchesne feeder canal, Moon Lake project, Utah. (Specifications 1206-D).

Southern California Gas Co., 810 South Flower Street, Los Angeles, has let general contract to Ryan A. Grut, 318 West Ninth Street, for equipment storage and distribution depot at 400 North Foothill Road, Beverly Hills, consisting of one-story repair and service shop, garage, pumping station and other structures. Cost about $60,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 7 for boiler tube brushes, wire bristle, expanding-type, and brush refills (Schedule 5685); until April 11, 100 acetylene gas cylinders, minimum capacity 225 cu. ft. (Schedule 5902) for Mare Island Navy Yard.

Board of Trustees, University of Idaho, Moscow, Idaho, plans extensions and improvements in power house, including new boiler unit and auxiliary equipment. Cost about $90,000. Appropriation in that amount has been authorized.

FOREIGN

Public Works Department, Government of New Zealand, Christchurch, New Zealand, asks bids until May 23 for one 100-ton electric traveling crane for Highbank power station, near Christchurch (Section 8); until May 9, turbine unit, electric generator and control equipment, with four transformers for power station, Christchurch district; until May 16, galvanized steel transmission towers for Palmerston-North Bunnythorpe-Ongarue power transmission line.

Imperial Oil, Ltd., 56 Church Street, Toronto, Ont., has authorized expansion in main oil refinery at Calgary, Alta., including new operating units, with cracking division for gasoline production, steel tank storage and distributing facilities and other structures. Cost about $1,700,000 with machinery.

THIS WEEK'S MACHINE ...TOOL ACTIVITIES...

... Sales trend still upward, with sharp increase reported in the East ... Senate Committee approves $22,000,000 appropriation for arsenal modernization.

Further Move Upward Reported in Sales

CINCINNATI—Further upward movement of machinery demand was recorded in this area during the past week. Foreign business continues at good rate, apparently unaffected by unsettled conditions in Europe. Some quickening of domestic ordering is also noticed and manufacturers indicate a more sincere tone to the brisk volume of inquiry. Tool builders report some multiple unit requisitions for lathes, millers and grinders in addition to a fair volume of single tool orders. Present business involves all types, although drill manufacturers still report sluggish interest in their products.

Factory operations are averaging a little better than 50 per cent, with production in some instances falling behind shipping instructions. Night shifts are becoming more prevalent as manufacturers seek to meet delivery dates.

Senate Committee Approves $22,000,000 for Arsenals

CLEVELAND—Approval of the $22,000,000 War Department appropriation by the Senate subcommittee stands out as the most significant development of the week. The item covers arsenal modernization, including new tools and machinery. Meanwhile, activity of producers here continues good. A large order for a French airplane plant is nearing the production peak.

F. H. Chapin, president, National Acme Co., told stockholders that well over $1,000,000 in potential business is awaiting release, having been engineered and estimated. Releases are held up by business uncertainties, he said. March machine tool orders have been better than those in February, according to Mr. Chapin.

Sales Still Spotty In Chicago District

CHICAGO—Some sellers here are still in low spirits and say that present indications point to a poor March. One sales agency, however, continues optimistic as its March business seems sure to exceed that of February. Its distribution is varied and in some cases, especially large boring mills, horizontal boring equipment and large gear cutters, deliveries are as far advanced as five and six months. Tractor and diesel motor manufacturers in the Chicago area are quite well occupied. Some business was received recently from local tool and die shops and from machine tool builders in the vicinity of Chicago.

Kearney & Trecker Corp., Milwaukee, has received an order from the War Department for light milling machines valued at about $15,000 for Air Corps depot shops.

Sharp Increase in Sales Volume in the East

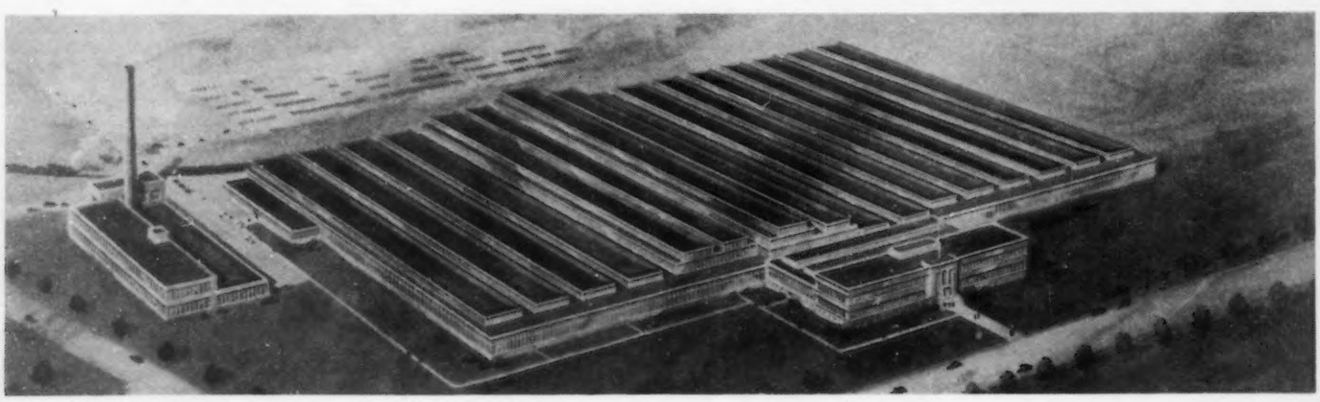
NEW YORK—Several of the larger electrical equipment manufacturers who had bought little if any machine tools last year are now actively in the market again. One such concern placed close to $100,000 worth of business in the past week. These purchases, added to a much better diversified general buying, made that week one of the best in some time. All indications are that March will be the highest month in point of dollar volume in over a year and a half. What encourages local sellers is the fact that general industrial sources have been added to aircraft engine and part sources, the tempo of whose buying has also been increased. Further activity on the part of the arsenals and the Navy yards is also looked for, particularly in view of increased Congressional appropriations for modernization of the Service shops.

Active Inquiry Still the Highlight of Detroit Market

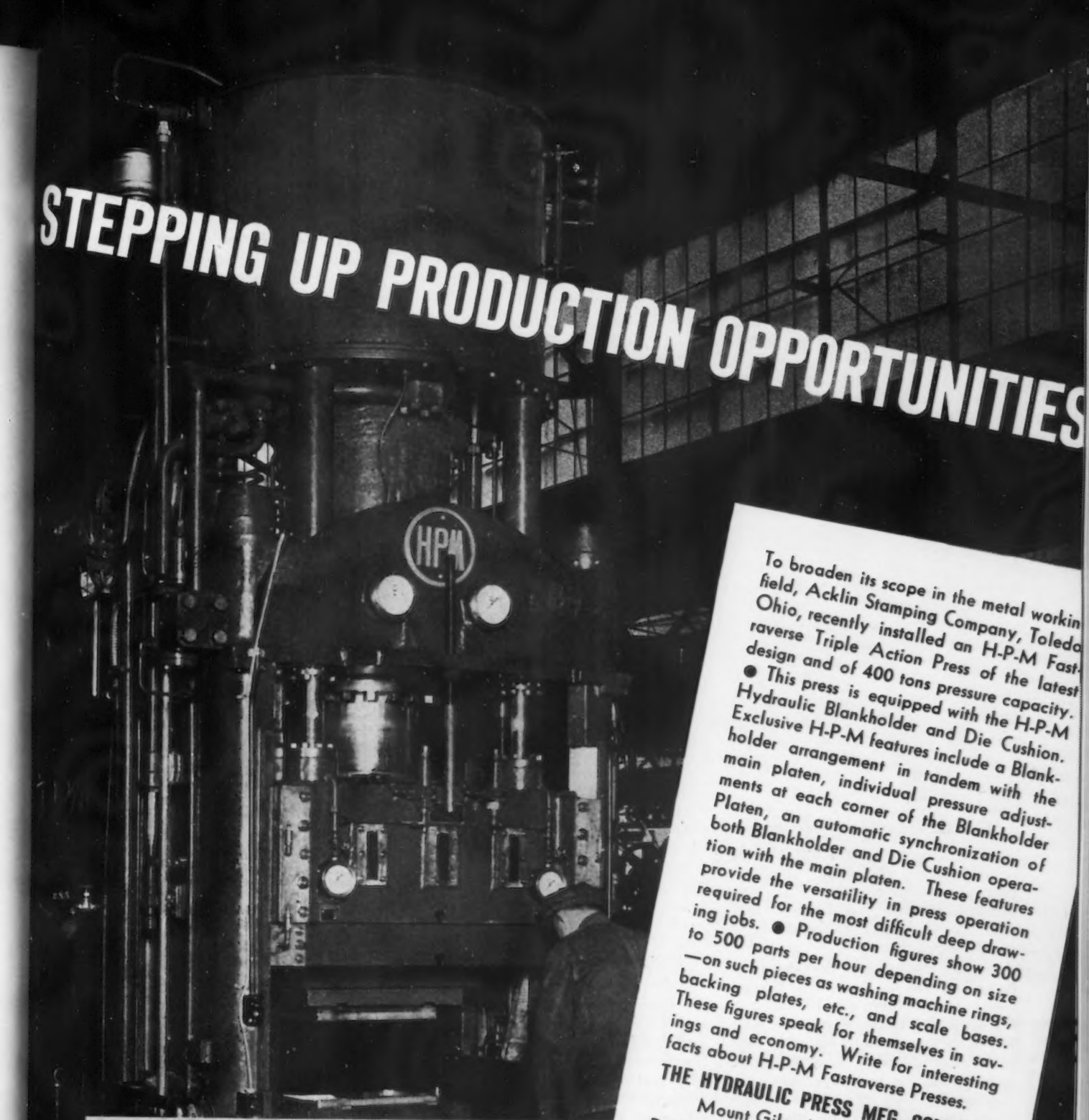
DETROIT—Inquiries that are quite widespread—but not indicative of any concentrated activity or big program at any one point—continued to be the marked feature of Detroit machine tool activity. Briggs is reported to be installing a polishing line for work on Mercury bodies at the Highland Park Plant. Meanwhile, four representatives of the Ford organization have departed for Europe, leading to a general belief that some program is contemplated for English and French plants, or both. The men who are making the trip are all prominent in Ford machine tool purchasing activities. Meanwhile, a check-up on results of the Machine and Tool Progress Exposition held recently reveals that buying interest was quite intense, resulting in the purchase of much equipment right off the floor.

Large Machine Tool Plant Under Construction

THE largest completely new machine tool plant to be constructed in many years is now under way at West Hartford, Conn., where on a 120-acre site the Pratt & Whitney division of the Niles-Bement-Pond Co. is erecting a one-story building 1000 ft. long and 50 ft. wide. In the foreground of the architect's drawing is a two-story office building. All of the one-story plant in the rear will be devoted to the manufacture of machine tools, small tools, gages, Keller machines and special machinery.



STEPPING UP PRODUCTION OPPORTUNITIES



To broaden its scope in the metal workin field, Acklin Stamping Company, Toledo Ohio, recently installed an H-P-M Fast- raverse Triple Action Press of the latest design and of 400 tons pressure capacity. ● This press is equipped with the H-P-M Hydraulic Blankholder and Die Cushion. Exclusive H-P-M features include a Blank- holder arrangement in tandem with the main platen, individual pressure adjust- ments at each corner of the Blankholder Platen, an automatic synchronization of both Blankholder and Die Cushion opera- tion with the main platen. These features provide the versatility in press operation required for the most difficult deep draw- ing jobs. ● Production figures show 300 to 500 parts per hour depending on size —on such pieces as washing machine rings, backing plates, etc., and scale bases. These figures speak for themselves in sav- ings and economy. Write for interesting facts about H-P-M Fastraverse Presses.

THE HYDRAULIC PRESS MFG. COMPANY
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HPM FASTRAVERSE PRESSES

WITH THEIR *Exclusive* OPERATING SYSTEM

Light Alloys for Aircraft

(CONCLUDED FROM PAGE 30)

dependent on Young's Modulus "E" than upon any other property.

As regards aluminium alloys, the clad types of sheet material have established themselves strongly in aircraft construction. The strength properties of the sheets are such as to entail very little sacrifice of weight. The coating of pure aluminium gives improved bending properties and appears not to have any harmful effect on fatigue properties of the sheets. It affords remarkable corrosion resistance to the sheets, rendering elaborate protective treatment unnecessary except for severe conditions. Spot welding of the sheets does not lead to the formation of local areas very susceptible to early attack as it is liable to do in heat treated sheets of uncoated alloys and the sheets require very little, if any, preparation for spot welding. In hulls and floats, the presence of the coating has substantially overcome the problem of rivet corrosion, though slight corrosion of the sheets at and about rivets is liable to occur in hulls and floats unless suitable precautions are taken.

Careful Treatment Necessary

Of the wrought high-strength aluminium alloys of the heat treatable type, duralumin is probably the most resistant to corrosion, but for high resistance to corrosion, especially to the intercrystalline form of corrosion, the heat treatment has to be carefully controlled and the quenching conducted so as to achieve rapid transfer to the quenching medium and rapid cooling to the temperature of a cool bath. It is also necessary to avoid subsequent reheating to temperatures exceeding 248 deg. F. The wrought alloys of higher strength than duralumin are generally not quite so resistant to corrosion as duralumin, and the alloys which are subjected to elevated aging treatment after solution heat treatment to develop optimum mechanical properties are generally more susceptible to the intercrystalline form of corrosion and to stress corrosion cracking. In the clad forms the coating provides a practical safeguard against serious attack except in very severe conditions, but for other forms the selection of high efficiency protective treatment is very necessary.

The group of wrought light alloys containing 5 to 9 per cent of magnesium, is the one that has hitherto gained greatest prominence in Great Britain. Though the usual forms of this alloy are not normally strengthened by heat treatment, the wrought forms possess considerable intrinsic strength and high resistance to corrosion. Prolonged exposure to marine influences does eventually lead to corrosion, which is liable to be intercrystalline in character, but the material is amenable to anodic treatment.

In view of the high chemical activity of magnesium, the resistance to corrosion of some of the modern alloys is nothing less than surprising. These alloys and the casting alloys as produced today represent something very different from the product of ten years ago as regards corrosion resistance, largely owing to the improved technique in extraction, melting and casting of the metal. The alloys are, however, liable to corrode and require protection not only in service but also during storage and intermediate stages of manufacture. The corrosion resistance of the casting alloys is not much affected by solution heat treatment, but is usually rendered somewhat lower by subsequent precipitation heat treatments. As has been the case with other alloys, including aluminium-rich alloys, the corrosion resistance is greatest in the cast condition, and the resistance of cast surfaces is greater than that of machined surfaces. An important feature is that corrosion, if it occurs, is of the surface attack type.

Recent laboratory experiments suggest that the fatigue properties under reversed bending stresses are reduced somewhat in magnesium-rich alloys by previous straining of the material longitudinally in tension. Under fluctuating direct stresses the fatigue resistance was lowered substantially for magnesium-rich alloys and to a less extent for duralumin by previous bending and re-straightening of the pieces. These aspects of fatigue bear closely upon the successful use of the light alloys and merit further study.

Service failures in light alloys under steady stress and corrosion have been very few indeed. Such failures as have occurred have usually not been attributable to the effects of the operating stresses, but to stresses arising from the manner of production of the component from the raw material or to assembly of part of a structure in such a way as to impose steady stress. Duralumin is relatively insensitive to stress corrosion effect if correctly heat treated, that is, the depreciation in mechanical properties such as breaking load and elongation is not much affected by static stresses applied simultaneously with the salt spray. This aspect of stress-corrosion study is very important and interesting, but the question of liability to fail under prolonged application of steady stress and corrosive influence is probably of more importance to the aircraft engineer.

TRADE NOTES

Truscon Steel Co., subsidiary of Republic Steel Corp., reported a loss for 1938 of $813,057. This compares with a profit in 1937 of $439,718. Sales for 1938 were $16,174,357, as compared with $23,527,812 in 1937.

Dayton Rogers Mfg. Co., Minneapolis, is distributing gratis a celluloid calculator which permits ready calculation of the weights of flat steel, aluminum, cast iron, copper, bronze and lead.

The Super Speed Press Corp., 55 Liberty Street, New York, has recently concluded an agreement with the Ferracute Machine Co., Bridgeton, N. J., whereby all Super Speed Presses will be exclusively manufactured for them by the Ferracute Co.

Crucible Steel Co. of America has received license to manufacture Ledloy under Inland patents. Ledloy is the new lead-bearing steel developed and introduced by the Inland Steel Co. last year.

The Beckwith Machinery Co., Pittsburgh, has closed with the Bucyrus-Erie Co., builder of all sizes and types of excavating machinery, to handle Bucyrus-Erie shovels, draglines and buckets, clamshells, lifting cranes and drag shovels ranging from ⅜-yd. to 2¼-yd. size.

Lancaster Iron Works, Inc., has consolidated its engineering, research and development activities at its new research laboratories, 85 Zabriskie Street, Hackensack, N. J., telephone Hackensack 3-2325.

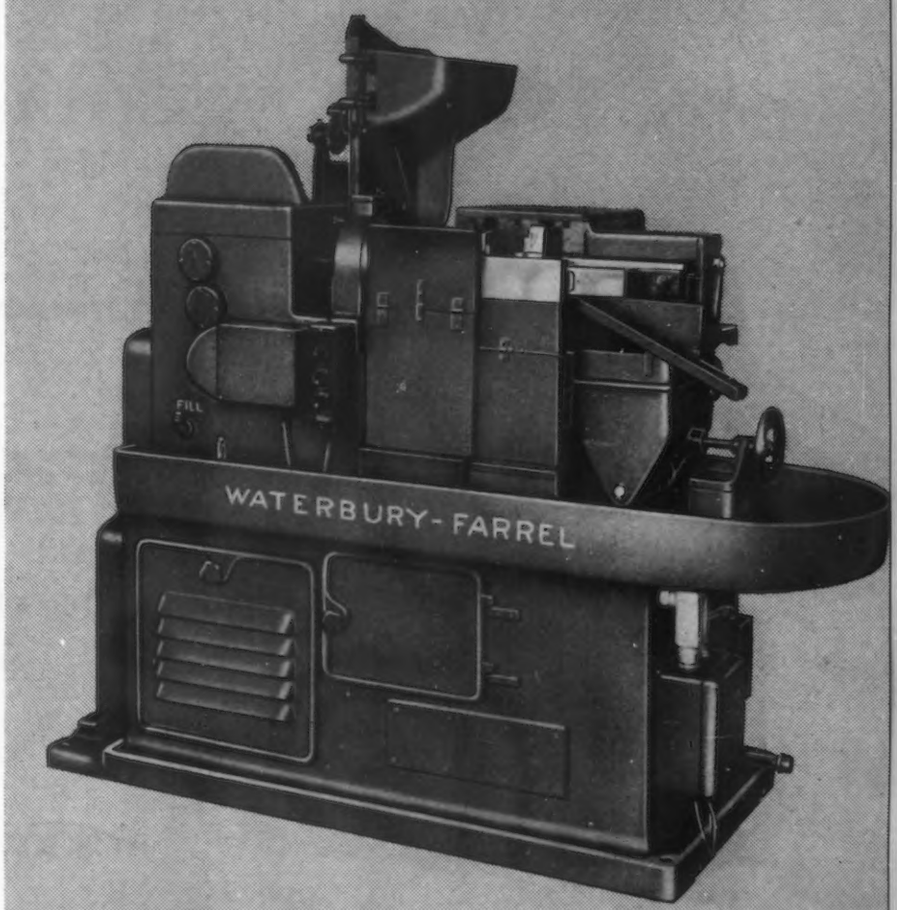
The Diamond Chain & Mfg. Co., of Indianapolis, Ind., maker of Diamond roller chains and sprockets, conveyor chains and flexible couplings, has added three new distributers: Barrett Hardware Co., Joliet, Ill.; Iowa Machinery & Supply Co., Des Moines, Iowa, and Lakeshore Machinery & Supply Co., Muskegon, Mich.

W. J. White Co., 307-8 Stormfeltz-Loveley Building, 7310 Woodward Avenue, Detroit, has been appointed by the Ransome Concrete Machinery Co., Dunellen, N. J., as district representative to handle their new welding table and positioner in the southern peninsula of Michigan.

B. F. Goodrich Co., Akron, reports net earnings for the year ended Dec. 31, 1938, of $2,240,119, after provision of $400,000 for federal income taxes. This compares with a loss of $878,580 for the year 1937.

Timken Roller Bearing Co. reports net profit of $1,427,902 for the year 1938, compared with $10,837,366 in 1937. The company listed assets at the close of the year at $24,915,011, including $2,964,851 in cash and $8,170,635 in securities. Liabilities, including provision for Federal and other taxes, were $1,984,583.

Precision Nut Tapping at High Speeds



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AUTOMATIC NUT TAPPING MACHINES

Entirely new from the ground up — new in principle — startling in performance—revolutionary!

The No. 2 size illustrated handles any standard nut from 1/4" to 1/2", although normally rated as a 1/2" machine, that is, it will tap nuts up to 7/8" across flats and 1/2" thick.

Send for further particulars.

WATERBURY FARREL FOUNDRY AND MACHINE COMPANY

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Get this Point!

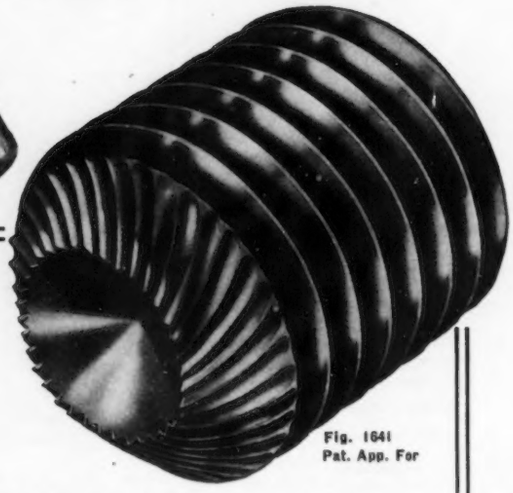

Fig. 1641
Pat. App. For

UNBRAKO

SELF-LOCKING HOLLOW SET SCREWS
WITH THE KNURLED POINTS
will protect your machines from accidents or breakdowns caused by ordinary set screws working loose

Tests and actual usage prove that once tightened up, these screws will hold tight despite vibration, shaking or jarring. They are no trouble to install and they can be easily taken out with an ordinary wrench for making adjustments and used over and over again. Why take chances when you can be sure the "Unbrako" Self-Locker will not fail you.

Send the coupon for facts and figures.

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COMPANY _____

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SELF-LOCKING
Square Head
SET SCREW

Stays put in spite of severe vibration

Now "Unbrako" Square Head Set Screws have this unique added feature . . . they automatically lock in place just by being turned up tight in the normal manner. The knurled points do the trick. These screws can be removed with ordinary wrenches and re-used indefinitely.

Fig. 1646
Pat. App. For

Announcing

LAKE ERIE
HY-PRODUCTION
Streamliners

In hourly output, in ease of operation, in adaptability, in accessibility,—these new Lake Erie Streamliners are as modern in performance as in appearance.

The first group of these new Streamliners is giving one of the world's largest automobile manufacturers the exclusive advantages and economies of hydraulic operation.

The fact that they are replacing mechanical presses is dramatic proof of their ability to deliver volume production of deep and shallow stampings.

Included in their features are—

1. ***Strong, rigid cast steel construction.***
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4. ***Moving platen guided by angular gibs, adjustable to maintain accurate guiding.***
5. ***Built in a complete range of sizes and capacities.***

The modern appearance and performance of Lake Erie HY-PRODUCTION STREAMLINERS are self-evident tributes to the ability of Lake Erie Engineers. You are invited to "put it up to Lake Erie," by writing an outline of your requirements.

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LAKE ERIE
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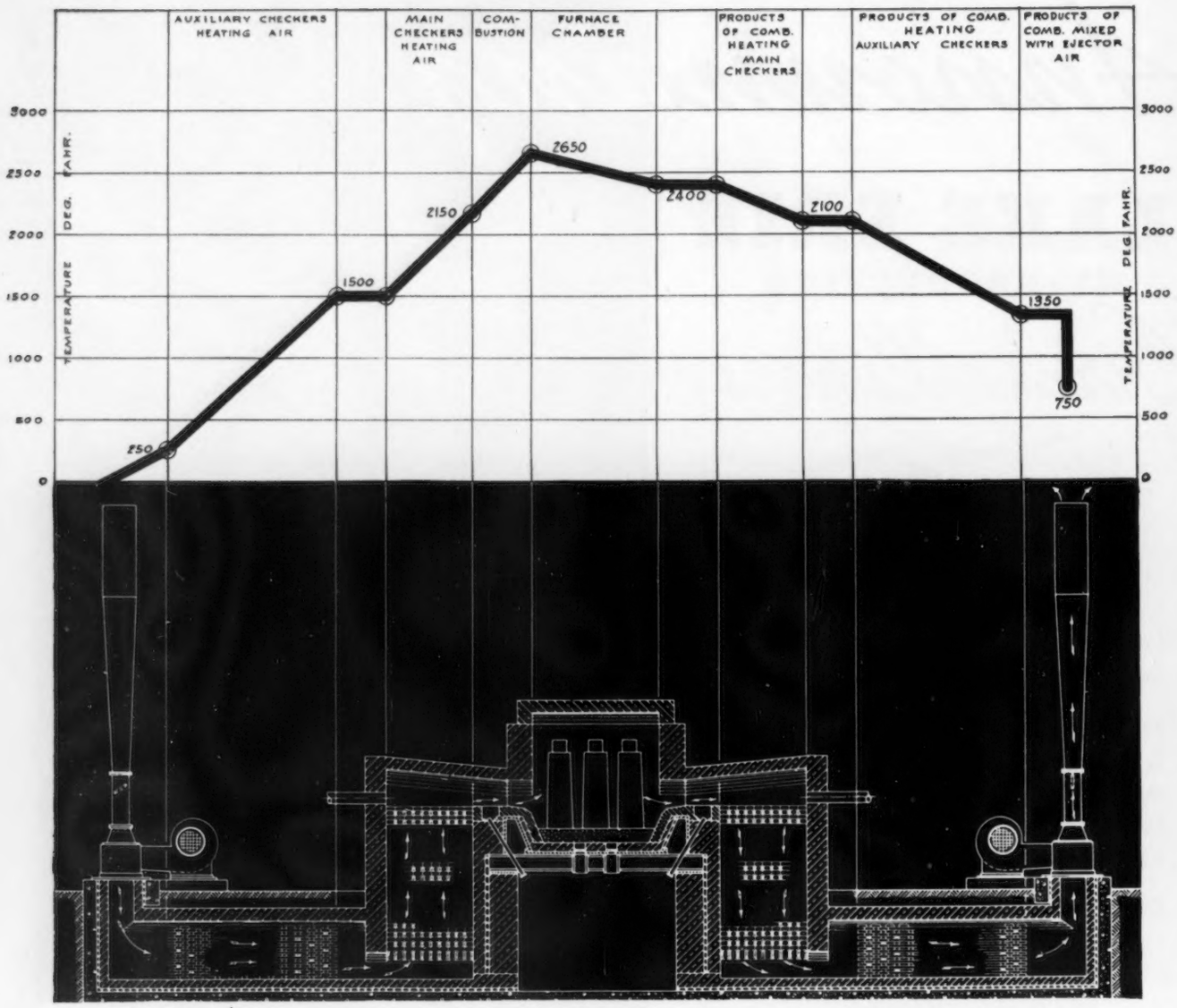
BUFFALO, N.Y. U.S.A.

YOU CAN DO IT BETTER ON A HYDRAULIC



Follow the Line to Faster Re-Heating with Blast Furnace Gas

The line in the chart above indicates the steady rise in temperature as air approaches the re-heating furnace chamber. The efficiency of blast furnace gas is increased as the temperature of the air is raised.

Full advantage of this fact is taken in the construction of the Isley Regenerative Furnace Control Systems. Gases leaving one side of the furnace pass through checkers, storing a large portion of the heat, which is picked up as the air returns. This draft is produced by air injectors in the two short venturi tubes. Reversing damper valves in the tubes are operated manually, or automatically, according to time cycles or temperature recordings. Complete instrumentation is provided for flexible and accurate control of combustion.

Let Morgan engineers study your furnace problems and help you produce better steel at a better profit.

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English Representative: INTERNATIONAL CONSTRUCTION COMPANY
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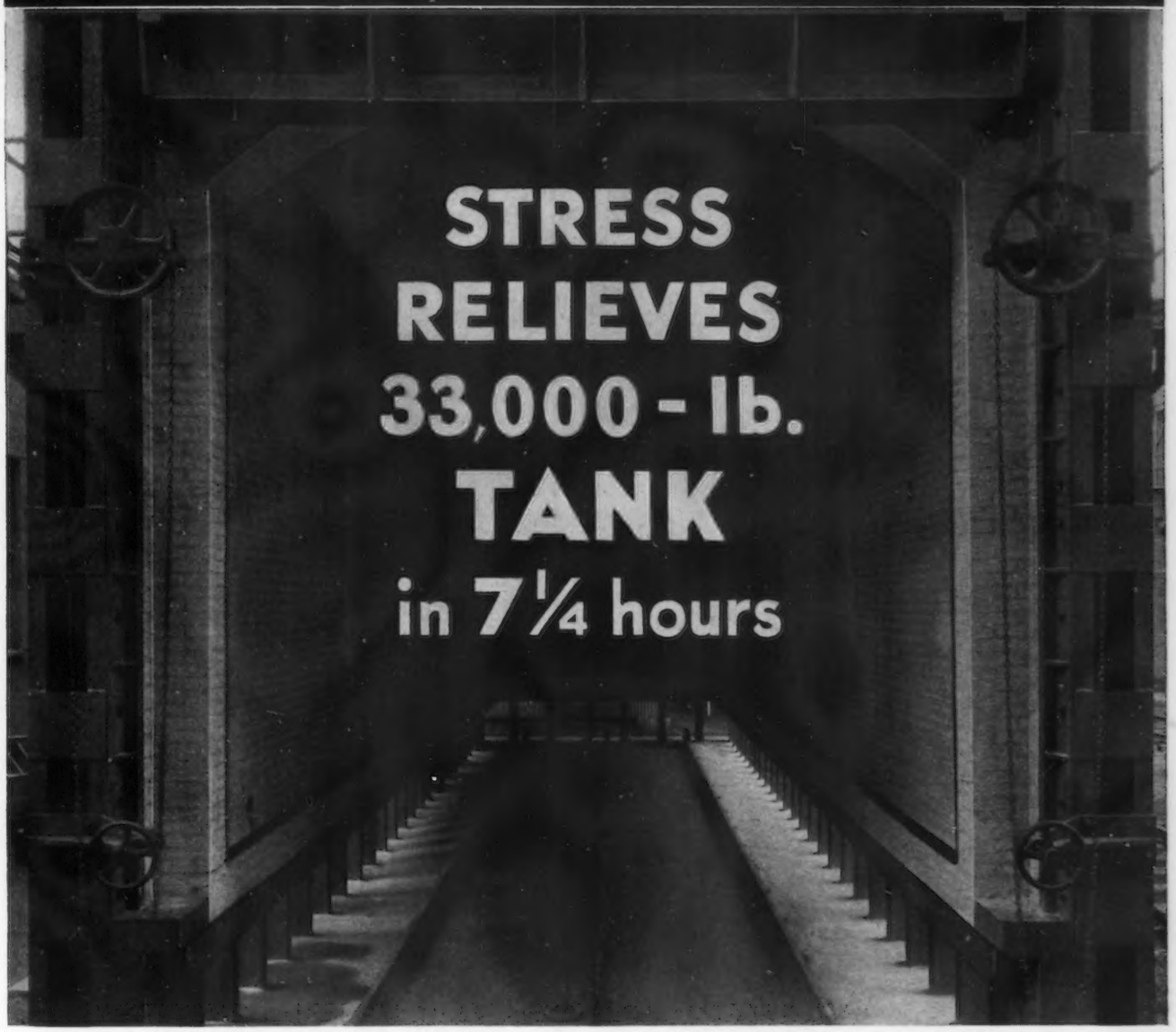
V-12

A.C.F. USES B & W INSULATING FIREBRICK



Car-bottom stress-relieving and annealing furnace at American Car and Foundry Company, Milton, Pa. plant. Constructed of B&W Insulating Firebrick; designed and built by Morris Engineering Company of Philadelphia.

Significant Facts

Furnace dimensions (inside): 47½ ft. by 13 ft.; 17 ft. 3 in. high.
Side walls and end wall: 13 in. B&W Insulating Firebrick.
Arch and door: 9 in. B&W Insulating Firebrick
Car top: 3 in. B&W Insulating Concrete, covered by 7½ in. B&W Insulating Firebrick and paved with 4½ in. dense firebrick.
Typical job: Chlorine tank, 33,000 lb., annealed at 1550 F.
Total annealing time, including heating up and cooling: 7¼ hours.

Superior Performance, with B & W Insulating Firebrick

B&W Insulating Firebrick were selected for this and other up-to-date stress-relieving furnaces because of their high insulating value and low heat-storage capacity—resulting in a short cycle and low fuel consumption. Other features include resistance to spalling and high load-bearing properties.

Technical data will be gladly sent upon request
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BABCOCK & WILCOX

PRODUCTS INDEX

WHO MAKES IT

Here you find a weekly listing of hundreds of products with the names and addresses of manufacturers. The advertisements of these companies appear in The Iron Age.

ABRASIVE CLOTH & PAPER
Norton Co., Worcester, Mass.

ABRASIVE WHEELS — See Grinding Wheels

ABRASIVES—Steel Shot and Grit
Harrison Abrasive Corp., Manchester, N. H.
Pangborn Corporation, Hagerstown, Md.
Pittsburgh (Pa.) Crushed Steel Co.
Steel Shot & Grit Co., Boston, Mass.

ACCESSORIES—Welding
Lincoln Electric Co., The, Cleveland.

ACCUMULATORS—Hydraulic
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

ACETYLENE—Dissolved in Cylinders & Small Tanks
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

ACIDS—Pickling
American Chemical Paint Co., Ambler, Pa.

ALLOYS—Copper
American Brass Co., The, Waterbury, Conn.
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

ALLOYS—Ferro
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

ALLOYS—Magnesium
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

ALLOYS—Tungsten
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

ALLOYS—Vanadium
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

ALLOYS—Zinc Base Die Casting
Gardiner Metal Co., 4884 S. Campbell Ave., Chicago.
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ALUMINUM
Aluminum Co. of America, Pittsburgh.

AMMETERS & VOLTMETERS
General Electric Co., Schenectady, N. Y.
Weston Electrical Instrument Corp., Newark, N. J.

AMMETERS AND VOLTMETERS—Recording
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

AMMONIA RECOVERY PLANTS
Koppers Co., Pittsburgh.

ANGLES, BEAMS, CHANNELS AND TEES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago
Steel & Tubes, Inc., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

ANGLES, BEAMS, CHANNELS & TEES—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

ANNEALING—See Heat Treating

ANNEALING BOXES
Pittsburgh (Pa.) Annealing Box Co.
United Engineering & Fdry. Co., Pgh.

ANNEALING COVERS
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Pittsburgh (Pa.) Annealing Box Co.

ANODES—Lead
National Lead Co., 111 Bdway., N. Y. C.

APPAREL—Welding
Lincoln Electric Co., The, Cleveland.

ARBORS
Cincinnati (Ohio) Milling Mch. Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

ARMORING MACHINERY—Cable, Wire, Hose
Sleeper & Hartley, Inc., Worcester, Mass.

ARRESTERS—Spark
Harrington & King Perforating Co., Chicago.

ASBESTOS
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St., N. Y. C.

AXLES—Car or Locomotive
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BABBITT METALS
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Cramp Brass & Iron Foundries Co., Philadelphia.
Gardiner Metal Co., 4884 S. Campbell Ave., Chicago.
National Lead Co., 111 Bdway., N. Y. C.

BALANCING MACHINES — Static Dynamic
Gisholt Machine Co., Madison, Wis.

BALING PRESSES—Scrap — See Presses—Baling

BALLS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Hartford (Conn.) Steel Ball Co., The.

BALLS—Steel, Brass or Bronze
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Hartford (Conn.) Steel Ball Co., The.
New Departure Div., General Motors Corp., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

BANDS—Steel
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BANDS—Welded
American Welding & Mfg. Co., Warren, Ohio.

BARRELS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.

BARRELS—Tumbling
Baird Mch. Co., The, Bridgeport, Conn.
Hartford (Conn.) Steel Ball Co., The.
Whiting Corp., Harvey, Ill.

BARS—Alloy
Midvale Co., The, Nicetown, Phila., Pa.
Republic Steel Corp., Cleveland, Ohio.

BARS—Aluminum
Aluminum Co. of America, Pittsburgh.

BARS—Brass, Bronze or Copper
Bunting Brass & Bronze Co., Toledo, Ohio.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

BARS—Cold Drawn
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

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Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Nicetown Plate Washer Co., Inc., Philadelphia.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BARS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

BARS—Rustless
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.

BARS—Steel
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Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
LaSalle Steel Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Steel & Tubes, Inc., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

BATTERIES—Storage
Electric Storage Battery Co., The, Phila.

BATTERY CHARGERS
Cutler-Hammer, Inc., Milwaukee.

BEAMS—See Angles, Beams, Channels and Tees

BEARINGS—Babbitt
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

BEARINGS—Ball
Bantam Bearings Corp., The, South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., Poughkeepsie, N. Y.

BEARINGS, Brass and Bronze
Ampco Metal, Inc., Milwaukee, Wisc.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.

BEARINGS—Oilless
Bunting Brass & Bronze Co., Toledo, O.
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BEARINGS—Quill
Bantam Bearings Corp., The, South Bend, Ind.

BEARINGS—Radial
Bantam Bearings Corp., The, South Bend, Ind.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Hyatt Bearings Div. General Motors Corp., Newark, N. J.
New Departure Div., General Motors Corp. Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y

BEARINGS—Roll Neck
Bantam Bearings Corp., The, South Bend, Ind.
Morgan Construction Co., Worcester, Mass
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton O.

BEARINGS—Roller
Bantam Bearings Corp., The, South Bend, Ind.
Hyatt Bearings Div. General Motors Corp., Newark, N. J.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Roller Tapered
Bantam Bearings Corp., The, South Bend, Ind.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Rolling Mill Equipment
Bantam Bearings Corp., The, South Bend, Ind.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Shaft Hanger
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Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

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Bantam Bearings Corp., The, South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Hyatt Bearings Div. General Motors Corp., Newark, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Timken Roller Bearing Co., The, Canton, O.

BELT—Conveyor, Elevator
Goodrich, B. F., Co., The, Akron, Ohio.
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BELTING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

BELTING—Metal, Conveyor, High and Low Temperature
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

BELTING—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BELTS—V-Type
Allis-Chalmers Mfg. Co., Milwaukee.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

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BENDING MACHINES—Hand and Power
Buffalo (N. Y.) Forge Co., 192 Broadway.
Cincinnati (Ohio) Shaper Co., The.
Kane & Roach, Inc., Syracuse, N. Y.
Niagara Machine & Tool Works, Buffalo, N. Y.

BENZOL RECOVERY PLANTS
Koppers Co., Pittsburgh.

BERYLLIUM COPPER
American Brass Co., The, Waterbury, Conn.

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Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.

BILLETS—Carbon
Harrisburg (Pa.) Steel Corp.

BILLETS—Chrome Nickel Steel
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Chrome Steel
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Forging
Alan Wood Steel Co., Conshohocken, Pa.
Harrisburg (Pa.) Steel Corp.
Republic Steel Corp., Cleveland, Ohio

PRODUCTS INDEX

BILLETS—Re-rolling
Alan Wood Steel Co., Conshohocken, Pa.

BILLETS—Steel
Bethelhem (Pa.) Steel Company.
Continental Steel Corp., Kokomo, Ind.
Harrisburg (Pa.) Steel Corp.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BLANKS—Chisel
Cleveland Steel Tool Co., The, 660 E. 82nd St., Cleveland, Ohio.

BLANKS—Gear and Pinion
American Welding & Mfg. Co., Warren, Ohio.
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

BLANKS—Gear, Silent Steel
Waldron, John, Corp., New Brunswick, N. J.

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R-S Products Corporation, Phila., Pa.

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Ingersoll-Rand Co., 11 Broadway, N. Y. C.

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Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

BLOWPIPES — Soldering, Heating, Annealing
American Gas Furnace Co., Elizabeth, N.J.

BOILERS—Waste Heat
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BOILERS—Water Tube
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

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National Machinery Co., Tiffin, Ohio.

BOLT AND NUT MACHINERY
Acme Machinery Co., The, Cleveland.
Ajax Mfg. Co., The, Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Waterbury (Ct.) Farrel Fdry. & Mch Co., The.

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Acme Machinery Co., The, Cleveland.

BOLT & RIVET CLIPPERS
Helwig Mfg. Co., St. Paul, Minn.

BOLTS—Carriage and Machine
Cleveland (Ohio) Cap Screw Co., The.
Lamson & Sessions Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., Cleveland.

BOLTS—Special
Lamson & Sessions Co., The, Cleveland.
Ohio Nut & Bolt Co., The, 614 Front St., Berea, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Special, Hot or Cold Upset
Lamson & Sessions Co., The, Cleveland.

BOLTS—Stove
Lamson & Sessions Co., The, Cleveland.
Progressive Mfg. Co., Torrington, Conn.

BOLTS—Stove, Recessed Head
American Screw Co., Providence, R. I.

BOLTS—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BOLTS AND NUTS
American Screw Co., Providence, R. I.
Clark Bros. Bolt Co., Milldale, Conn.
Lamson & Sessions Co., The, Cleveland
Ohio Nut & Bolt Co., The, 614 Front St., Berea, Ohio.
Republic Steel Corp., Cleveland, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., Cleveland.

BOLTS AND NUTS—Self Locking
Lamson & Sessions Co., The, Cleveland.

BOLTS & NUTS—Welding
Ohio Nut & Bolt Co., The, 614 Front St., Berea, Ohio.

BOND—Grinding Wheel
Bakelite Corp., 247 Park Ave., New York City.

BORING BARS
Bullard Co., The, Bridgeport, Conn.

BORING, DRILLING & MILLING MACHINES—Horizontal
Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
Lucas Machine Tool Co., Cleveland.

BORING & DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo, Ohio.
Bullard Co., The, Bridgeport, Conn.

BORING MACHINES—Diamond & Carbide Tools
Heald Machine Co., Worcester, Mass.

BORING MACHINES—Jig
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

BORING MACHINES—Precision
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

BORING & TURNING MILLS—Vertical
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Planer Co.

BRAKE LINING AND BLOCKS—Asbestos
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BRAKES—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Electric & Mechanical
Clark Controller Co., The, Cleveland.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

BRAKES—Metal Forming
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Ferracute Machine Co., Bridgeton, N. J.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Steelweld Machinery Co., Cleveland.

BRICK—Fire Clay
Carborundum Co., The, Niagara Falls, N. Y.
Illinois Clay Products Co., Joliet, Ill.

BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BRIDGE BUILDERS
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Belmont Iron Works, Philadelphia.

BRIDGE OPERATING MACHINERY—Movable
Earle Gear & Mch. Co., Philadelphia.

BRIQUETS—Ferroalloy
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

BROACHES
Colonial Broach Co., Detroit.
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Milling Mch. Co., The.
Colonial Broach Co., Detroit.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

BRONZE FOR DIES
Ampco Metal, Inc., Milwaukee, Wisc.

BRONZE—Phosphor
Bunting Brass & Bronze Co., Toledo, Ohio.

BUCKETS—Clamshell
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh, Pa.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Hayward Co., The, 50 Church St., N. Y. C.
Industrial Brownhoist Corp., Bay City, Mich.
Wellman Engineering Co., The, Cleveland

BUCKETS—Electric Motor
Hayward Co., The, 50 Church St., N. Y. C.

BUCKETS—Grab
Wellman Engineering Co., The, Cleveland

BUCKETS—Orange Peel
Hayward Co., The, 50 Church St., N. Y. C.

BUFFERS & POLISHING MACHINES
Packer Machine Co., The, Meriden, Conn.

BUFFING APPLICATORS—Automatic
Packer Machine Co., The, Meriden, Conn.

BUILDINGS—Steel
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
American Rolling Mill Co., Middletown, Ohio.
Belmont Iron Works, Philadelphia.
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh, Pa.
Iron & Steel Products, Inc., Chicago.

BULLDOZERS
Ajax Mfg. Co., The, Cleveland, Ohio.
Steelweld Machinery Co., Cleveland.

BURNERS—Oil or Gas
American Gas Furnace Co., Elizabeth, N. J.

BURRING MACHINES
Acme Machinery Co., The, Cleveland.

BUSHINGS—Bronze
Ampco Metal, Inc., Milwaukee, Wisc.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, Ohio.

BUSHINGS—Drill Jig
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

BUSHINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BUSHINGS—Phosphor Bronze
Bunting Brass & Bronze Co., Toledo, Ohio.

JUST BETWEEN US TWO

We Take in an Assembly Line

The driver who drove the busload of us from the Detroit convention hall to the Plymouth plant was apparently a stranger in town. He couldn't find the plant and was too embarrassed to ask directions, so we got there forty minutes late.

We had just about reached the body drop on the main assembly line when the plant stopped at 11 A.M. for the thirty minute lunch period. Having just finished reading *"F.O.B. Detroit,"* which is all about how the killing pace in automobile plants drives strong men nuts, we looked around eagerly for neuroses, expecting to find them blooming all over the place.

But we couldn't find any. Everyone we spoke to seemed tiresomely sane, quite healthy, and a little peevish about our search for psychopathic symptoms. Our best bet was a former striper who told us he had nightmares when first put on the assembly line, but we lost interest when he said that was ten years ago. Anyway, what he wanted to talk about mostly was the trick of painting a straight stripe, in the pre-striping machine days, while in the throes of a hangover.

Without let or hindrance we wandered all over the plant, peering over shoulders, coming within an ace of being beaned by flying fenders, and blocking hand trucks. Every minute we expected to be tapped on the shoulder and asked what the hell did we think the white lines were for—bicycle riders? But we didn't run across a single boss, and remarked on their absence. "We don't need many," one of the men told us, "as they can tell in the final inspection just who is responsible for a mistake."

When the line started moving again at 11:30 a wag yelled, "Come on, boys, man the bolts!"

Next to him was a fellow who placed washers and nuts on two bolts. Apparently the work had lost its thrill for him, for he seemed bored, and once we saw him put two nuts on the same bolt, and leave one blank. We were just about to perform a noble deed, when he noticed it himself, and corrected it before the moving automotive foetus got out of reach.

Our preconceived idea that cars are made in batches—black sedans on Wednesdays, green coaches on Thursday afternoons, convertible coupes on odd Friday mornings, and so on—was wrong. Instead, we found each car is made to order; moreover the unseen brain that schedules things so that a gray body meets up with gray fenders and with wheels and other things to match, seems to think it wouldn't be sporting to allow one color or even one body type to follow another in the line. We didn't see a single set of twins.

One of the men told us that sometimes things go haywire—green wheels get put on a black job—a car is part deluxe and part standard—and like that. We told him we supposed they let the Cinderellas pile up for a week or so, and then run the line backward for about an hour, but he said, no, they unscramble them a la carte.

What saddened us was that after all the work and loving care bestowed on the assembly of a car, when it was finished everyone seemed to lose interest, and toward the end of the line it was as bereft of friends as a New Dealer in the club car from Westchester. You would think that the least they could do would be to christen it by breaking a bottle of "coke" over the radiator ornament.

Instead, it marches forlornly to the end of the line—apparently forgotten—and just when you are beginning to get worried about a crash, someone steps casually out of nowhere, steps on the starter, and drives off. We waited anxiously to see what would happen if one failed to start, but it always did.

Puzzles

Both shoulders of Marvin L. Miller's difficult equation are pinned to the mat by J. E. Morelock and J. William De Poy. George J. Hunter contributes this bit of padded cell bait for Marvin to toy with:

> *Prove that, if the first 4 figures of a perfect square of 8 figures are identical, they cannot be either 5 or 9.*

And if he can solve in twenty seconds this one submitted by H. M. Huffman of the Cincinnati Milling Machine Co. he needn't worry about his college entrance exams:

> *In the center of a pool 40 ft. square is a platform 30 ft. square, which leaves 10 ft. from the edge of the pool to the platform. A man has two planks, each 9 ft. 11½ in. long. Assuming that the planks are weightless and that the man has no nails or other means of binding the planks, how can he reach the platform without wetting his feet?*

—A.H.D.

PRODUCTS INDEX

BY-PRODUCTS COKE AND GAS OVENS
Koppers Co., Pittsburgh.

CABLE—Electric
General Electric Co., Schenectady, N. Y
Lincoln Electric Co., The, Cleveland.

CABLEWAYS AND TRAMWAYS—See Tramways

CALCIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CARBIC
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

CARBIDE
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

CARBIDE—Boron
Norton Co., Worcester, Mass.

CARBURIZING—See Heat Treating

CARLOADERS
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.

CARS—Railway
Iron & Steel Products, Inc., Chicago.

CARS—Industrial and Mining
Atlas Car & Mfg. Co., The, Cleveland.

CASE HARDENING—See Heat Treating

CASTINGS—Acid or Heat Resisting
Ampco Metal, Inc., Milwaukee, Wisc.
Cramp Brass & Iron Foundries Co., Philadelphia.
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
Hoskins Mfg. Co., Detroit, Mich.
Meehanite Metal Corp., Pittsburgh.
Michiana Products Corp., Michigan City, Ind.
Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—Alloy Iron
Cramp Brass & Iron Foundries Co., Philadelphia.
De Laval Separator Co., The, Poughkeepsie, N. Y.
Michiana Products Corp., Michigan City, Ind.

CASTINGS—Alloy Steel
Advance Foundry Co., The, Dayton, Ohio
Hartford (Conn.) Electric Steel Corp.
Michiana Products Corp., Michigan City, Ind.
National-Erie Corp., Erie, Pa.

CASTINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Brass, Bronze, Copper or Aluminum
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Carbon Malleable Casting Co., Inc., Lancaster, Pa.
Cramp Brass & Iron Foundries Co., Philadelphia.
De Laval Separator Co., The, Poughkeepsie, N. Y.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.
Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—Corrosion Resisting
Cramp Brass & Iron Foundries Co., Philadelphia.
Meehanite Metal Corp., Pittsburgh.
Michiana Products Corp., Michigan City, Ind.
Midvale Co., The, Nicetown, Phila., Pa.
Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—Die
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS—Die, Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Electric Steel
Crucible Steel Castings Co., Lansdowne, Pa.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—Gray Iron
Advance Foundry Co., The, Dayton, Ohio.
American Engineering Co., Philadelphia.
Cramp Brass & Iron Foundries Co., Philadelphia.
De Laval Separator Co., The, Poughkeepsie, N. Y.
Dodge Mfg. Corp., Mishawaka, Ind.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
National Roll & Fdry. Co., Avonmore, Pa.
North Wales (Pa.) Mach. Co., Inc.
Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—High Test & Alloy Iron
Cramp Brass & Iron Foundries Co., Philadelphia.
De Laval Separator Co., The, Poughkeepsie, N. Y.
Meehanite Metal Corp., Pittsburgh.

CASTINGS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

CASTINGS—Malleable
Carbon Malleable Casting Co., Inc., Lancaster, Pa.
Lake City Malleable Co., The, 5100 Lakeside Ave., Cleveland.
Malleable Iron Fittings Co., Branford, Ct.
Peoria (Ill.) Malleable Castings Co.

CASTINGS—Manganese, Steel and Alloy
Pettibone Mulliken Corp., Chicago.

CASTINGS—Meehanite Metal
Meehanite Metal Corp., Pittsburgh.

CASTINGS—Monel & Nickel
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—Semi-Steel
Cramp Brass & Iron Foundries Co., Philadelphia.
Malleable Iron Fittings Co., Branford, Ct.

CASTINGS—Steel
American Rolling Mill Co., Middletown, Ohio.
Bethlehem (Pa.) Steel Company.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Crucible Steel Castings Co., Lansdowne, Pa.
Hartford (Conn.) Electric Steel Corp.
Malleable Iron Fittings Co., Branford, Ct.
Mesta Mch. Co., Pittsburgh.
Michiana Products Corp., Michigan City, Ind.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Standard Steel Wks. Co., Phila., Pa.
Steel Founders' Society of America, Cleveland.
Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS—Wear Resisting
Meehanite Metal Corp., Pittsburgh.

CEMENT—Acid-Proof
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

CEMENT—Refractory
Carborundum Co., The, Perth Amboy, N. J.
Johns-Manville Corp., 22 East 40th St., New York City.

CEMENT—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.

CENTER LAPPING MACHINES
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

CHAINS—Conveyor & Elevator
Baldwin-Duckworth Chain Corp., Springfield, Mass.

CHAINS—Power Transmission
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Roller
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Silent
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAIRS—Steel, Office
Harter Corp., Sturgis, Mich.

CHANNELS—See Angles, Beams, Channels and Tees

CHECKS—Metal
Cunningham, M. E., Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

CHEMICALS—Rust Proofing
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

CHROMIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CHUCKING MACHINES—Automatic
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

CHUCKING MACHINES—Multiple Spindle
Baird Mch. Co., The, Bridgeport, Conn.
Goss & DeLeeuw Machine Co., New Britain, Conn.
National Acme Co., The, Cleveland.
Potter & Johnston Machine Co., Pawtucket, R. I.

CHUCKS—Air Operated
Hannifin Mfg. Co., Chicago.

CHUCKS—Drill
Cleveland (Ohio) Twist Drill Co., The.
Cushman Chuck Co., Hartford, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

CHUCKS—Drill, Quick Change
Apex Machine & Tool Co., The, Dayton, Ohio.

CHUCKS—Electric
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Lathe
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Magnetic
Heald Machine Co., Worcester, Mass.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

CHUCKS—Tapping
Apex Machine & Tool Co., The, Dayton, Ohio

CLAY GUNS
Bailey, Wm. M., Co., Pittsburgh.

CLEANERS—Metal
American Chemical Paint Co., Ambler Pa.
Detroit Rex Products Co., Detroit, Mich.
Ford, J. B., Co., The, Wyandotte, Mich.

CLEANING COMPOUNDS—Alkali
Detroit Rex Products Co., Detroit, Mich.

CLEANING EQUIPMENT—Metal
Detroit Rex Products Co., Detroit, Mich.

CLEANING EQUIPMENT (METAL)—Electro-Chemical
Bullard Co., The, Bridgeport, Conn.

CLUTCH-BRAKES—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Hilliard Corp., The, Railroad Ave., Elmira, New York.
Medart Co., The, St. Louis, Mo.

CLUTCHES—Friction
Dodge Mfg. Corp., Mishawaka, Ind.
Twin Disc Clutch Co., Racine, Wis.

CLUTCHES—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 727 Smith St., Milwaukee.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES—Overrunning
Hilliard Corp., The, Railroad Ave., Elmira, New York.

COAL
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Hanna Furnace Corp., The, Detroit, Mich.
Koppers Coal Co., The, Pittsburgh.
Pickands Mather & Co., Cleveland.

COBALT METAL
Central Trading Corp., 511 Fifth Ave., N. Y. C.

COILS—Lead
National Lead Co., 111 Bdway., N. Y. C.

COILS—Pipe
Harrisburg (Pa.) Steel Corp.

COKE—Metallurgical
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Pickands Mather & Co., Cleveland.

COKE OVEN MACHINERY
Atlas Car & Mfg. Co., The, Cleveland.
Koppers Co., Pittsburgh.

COKE OVENS—By-Products
Koppers Co., Pittsburgh.

COKE OVENS—Cross Regenerators
Koppers Co., Pittsburgh.

COKE OVENS—With Recovery of By-Products
Koppers Co., Pittsburgh.

COLD ROLL FORMING MACHINES
Kane & Roach, Inc., Syracuse, N. Y.
McKay Machine Co., The, Youngstown, Ohio.

COLLETS
Rivett Lathe & Grinder, Inc., Boston, Mass.

COLLETS—Drill
Apex Machine & Tool Co., The, Dayton Ohio.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

COMBUSTION CONTROLS
Brown Instrument Co., The, Philadelphia.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Morgan Construction Co., Worcester, Mass.

COMPOUNDS—Drawing
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

COMPRESSORS—Air
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Ingersoll-Rand Co., 11 Broadway, New York City.
Westinghouse Air Brake Co., Industria Div., Pittsburgh.
Worthington Pump & Machinery Corp., Harrison, N. J.

COMPRESSORS—Gas
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Worthington Pump & Machinery Corp., Harrison, N. J.

COMPRESSORS—Rebuilt. (See Clearing House Section)

CONDENSERS—Surface & Jet
Ingersoll-Rand Co., 11 Broadway, N.Y.C.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS—Flexible Metallic
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

CONTACTS—Electrical
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

CONTRACTORS' SUPPLIES — Second-Hand. (See Clearing House Section)

CONTROL SYSTEMS—Temperature
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

CONTROLLERS—Crane
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

CONTROLLERS—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.
General Electric Co., Schenectady, N. Y.

CONTROLLERS—Valve, Electrically Operated
Brown Instrument Co., The, Philadelphia.
Cutler-Hammer, Inc., Milwaukee.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Vickers, Inc., 1420 Oakman Blvd., Detroit.

CONTROLS—Time Cycle
Koppers Co., Western Gas Div., Fort Wayne, Ind.

CONVEYING AND ELEVATING MACHINERY
Farquhar, A. B., Co., Ltd., York, Pa.
Logan Co., Inc., Louisville, Ky.

CONVEYOR WORMS
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.

CONVEYORS—Gravity
Logan Co., Inc., Louisville, Ky.

CONVEYORS—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

CONVEYORS—Portable
Farquhar, A. B., Co., Ltd., York, Pa.

COPING MACHINES
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

CORE OIL
Penola, Inc., Pittsburgh.
Sun Oil Co., Philadelphia.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

CORUNDUM WHEELS — See Grinding Wheels

COTTERS AND KEYS—Spring
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 745 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, Cleveland.
Western Wire Prods. Co., St. Louis, Mo.

COUNTERBORES
Cleveland (Ohio) Twist Drill Co., The.
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.
Gairing Tool Co., Detroit.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

COUNTERS—Production
Durant Mfg. Co., Milwaukee.
Veeder-Root, Inc., Hartford, Ct.

COUNTERS—Revolution, Recording
Durant Mfg. Co., Milwaukee.

COUNTING MACHINES
Durant Mfg. Co., Milwaukee.
Veeder-Root, Inc., Hartford, Conn.

COUPLINGS—Cut-off Friction
Hilliard Corp., The, Railroad Ave., Elmira, New York.

COUPLINGS—Flexible
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Poole Foundry & Mch. Co., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.
Wood's, T. B., Sons Co., Chambersburg, Pa.

COUPLINGS—Pipe
Harrisburg (Pa.) Steel Corp.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

CRANES—Crawling Tractor
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, Ohio.

CRANES — Electric, Industrial, Truck Mounted
Automatic Transportation Co., 75 W. 87th St., Chicago.
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANES—Electric Traveling
Armel, James P., Pittsburgh.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, Detroit, Mich.
Payne, N. B., 105 West 55th St., N. Y. C.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Gantry
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Hand Power
American Monorail Co., The, Cleveland.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, Detroit.

PRODUCTS INDEX

Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Jib
American Monorail Co., The, Cleveland.
Euclid Crane & Hoist Co., The, Euclid, O.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

CRANES—Locomotive
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, O.

CRANES—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Portable
Canton Fdry. & Mch. Co., Cleveland.

CRANES—Portable Electric
Automatic Transportation Co., 75 W. 87th St., Chicago.
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANKSHAFTS
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

CRANKSHAFTS—Forged
Bay City Forge Co., Erie, Pa.
Kropp Forge Co., Chicago, Ill.
Midvale Co., The, Nicetown, Phila., Pa.

CRUSHERS—Coal
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CRUSHERS—Steel Turning
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CUTTERS—Die Sinking
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Tomkins-Johnson Co., The, Jackson, Mich.

CUTTERS—Keyseating
Davis Keyseater Co., 400 Exchange St. Rochester, N. Y.

CUTTERS—Milling
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland (Ohio) Twist Drill Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

CUTTING-OFF MACHINES—Abrasives
Tabor Mfg. Co., Phila.

CUTTING-OFF MACHINES—Cold Saw
Espen-Lucas Mch. Wks., Philadelphia.

CUTTING-OFF MACHINES—Pipe or Tubing
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Bardons & Oliver, Cleveland.
Cox & Sons Co., The, Bridgeton, N. J.
Landis Mch. Co., Inc., Waynesboro, Pa.

CUTTING AND WELDING APPARATUS—Oxy-Acetylene—See Welding and Cutting Machines and Equipment—Oxy-Acetylene.

CYLINDERS — Compressed Air & Hydraulic
Tomkins-Johnson Co., The, Jackson, Mich.

CYLINDERS—Seamless
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.
National Tube Co. (U. S. Steel Corp Subsidiary), Pittsburgh.

DEGREASING MACHINES—Solvent
Detroit Rex Products Co., Detroit, Mich.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

DIE BLOCKS—Drop Hammer
Heppenstall Co., Pittsburgh.
Kropp Forge Co., Chicago, Ill.

DIE CASTING MACHINES
Reed-Prentice Corp., Worcester, Mass.

DIE FILING MACHINES
Grob Brothers, Grafton, Wis.
Harvey Mfg. Corp., 161 Grand St., New York City.

DIE SETS
U. S. Tool Co., Inc., Ampere, N. J.

DIE SINKING MACHINES — Automatic and Hand
Cincinnati (Ohio) Milling Mch. Co., The.
Pratt & Whitney Div., Niles-Bement-Pond Co. Hartford, Conn.

DIEING MACHINES—Automatic
Henry & Wright Mfg. Co., The, Hartford, Conn.

DIES, JIGS, FIXTURES, etc.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

DIES—Cast Tool Steel
Advance Foundry Co., The, Dayton, Ohio.

DIES—Pipe Threading
Acme Machinery Co., The, Cleveland.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

DIES—Screw and Thread Cutting
Acme Machinery Co., The, Cleveland.
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., The, New Haven, Conn.
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Self-Opening Adjustable
Acme Machinery Co., The, Cleveland.
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., The, New Haven, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Sheet Metal Working
Ferracute Machine Co., Bridgeton, New Jersey.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

DIES—Steel Letters and Stamps
Cunningham, M. E., Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

DIESEL FUEL INJECTORS
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

DOORS & SHUTTERS, Fireproof
Kinnear Mfg. Co., Columbus, Ohio.

DOORS & SHUTTERS—Steel or Wood Rolling
Kinnear Mfg. Co., Columbus, Ohio.

DRAW BENCHES
McKay Machine Co., The, Youngstown, Ohio.

DRAWN WORK—Metal—See Stampings or Drawings—Metal

DRILL HEADS—Multiple
Baker Bros., Inc., Toledo, Ohio.

DRILLING MACHINES—Bench
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Heavy Duty
Baker Bros., Inc., Toledo, Ohio.

DRILLING MACHINES—Multiple Spindle
Baker Bros., Inc., Toledo, Ohio.
Henry & Wright Mfg. Co., The, Hartford, Conn.

DRILLING MACHINES—Multiple Spindle Horizontal
Baker Bros., Inc., Toledo, Ohio.

DRILLING MACHINES—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Millers Falls Co., Greenfield, Mass.

DRILLING MACHINES—Portable Pneumatic
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., 11 Broadway, New York City.
Warner & Swasey Co., The, Cleveland.

DRILLING MACHINES—Radial
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.

DRILLING MACHINES—Sensitive
Buffalo (N. Y.) Forge Co., 492 Broadway.
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Upright
Baker Bros., Inc., Toledo, Ohio.
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo, Ohio.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

DRIVES—Gear
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.

DRIVES—Single & Multiple V-Belts
Allis-Chalmers Mfg. Co., Milwaukee.

DROP FORGINGS—See Forgings—Drop Iron or Steel

DROP HAMMERS—See Hammers—Drop

DUST COLLECTORS
Abrasive Machine Tool Co., East Providence, R. I.
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Pangborn Corporation, Hagerstown, Md.
Whiting Corp., Harvey, Ill.

ECONOMIZERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

ELECTRIC LIGHTING—Industrial
General Electric Co., Cleveland.
General Electric Vapor Lamp Co., Hoboken, N. J.

ELECTRIC WELDING — See Welding — Electric

ELECTRICAL EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee.

ELECTRICAL MACHINERY — Second Hand. (See Clearing House Section)

ELECTRICAL WIRES
Roebling's, John A., Sons Co., Trenton, N. J.

ELECTRODE HOLDERS—Welding
Lincoln Electric Co., The, Cleveland.

ELECTRODES—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

ELECTRODES—Welding, Coated
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Metal & Thermit Corp., 120 Broadway, N. Y. C.

ELECTROPLATING—Bright Nickel
Bright Nickel Corp., Detroit, Mich.

EMERY WHEELS—See Grinding Wheels

ENGINEERS—Consulting and Industrial
Hunt, C. H., Pittsburgh, Pa.
Koppers Co., Pittsburgh.
Lindemuth, Lewis B., 134 East 47th St., N. Y. C.

ENGINES—Diesel
Ingersoll-Rand Co., 11 Broadway, N. Y. C.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES—Gas
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES—Oil
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Worthington Pump & Machinery Corp., Harrison, N. J.

EYELET MACHINES
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

FACERS—Spot
Gairing Tool Co., Detroit.

FACING CLAY
Carborundum Co., The, Perth Amboy, N.J.

FACING MACHINES—Precision
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

FACTORY & PLANT SITES
Zoll, Edward H., Inc., 196 Market St Newark, N. J.

FANS—Cooling
Perkins, B. F., & Son, Inc., Holyoke, Mass.

FANS—Ventilating
Buffalo (N. Y.) Forge Co., 492 Broadway.

FEED WATER HEATERS AND PURIFIERS
Harrisburg (Pa.) Steel Corp.

FEEDS—Hydraulic, for Machines
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

FELT—Wool Mechanical
American Felt Co., 315 Fourth Ave., N. Y. C.

FENCING—Wire
Pittsburgh (Pa.) Steel Co.

FERROALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROMANGANESE
Bethlehem (Pa.) Steel Co.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank & Co., Inc., Philadelphia.

FERROMOLYBDENUM
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSILICO MANGANESE
Ohio Ferro-Alloys Corp., Canton, Ohio.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSILICON
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSILICON ALUMINUM
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSPIEGELEISEN
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

FERROTITANIUM
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E 42nd St., N. Y. C.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FILES & RASPS
Disston, Henry, & Sons, Inc., Philadelphia.
Nicholson File Co., Providence, R. I.

FILING MACHINES
Grob Brothers, Grafton, Wis.

FILTER CLOTH—Asbestos
Johns-Manville Corp., 22 East 40th St., New York City.

FILTERS—OIL
Cuno Engineering Corp., Meriden, Conn.
National Acme Co., The, Cleveland.

FIRE BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

FIRE CLAY
Carborundum Co., The, Perth Amboy, N. J.
Illinois Clay Products Co., Joliet, Ill.

FITTINGS—Brass, Pipe and Tube
Commonwealth Brass Corp., Detroit.

FLANGES—Forged Steel
Harrisburg (Pa.) Steel Corp.
Kropp Forge Co., Chicago, Ill.
Standard Steel Wks. Co., Phila., Pa.

FLANGES—Welded Steel
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

FLANGING WORK—Carbon and Alloy
Worth Steel Co., Claymont, Del.

FLEXIBLE SHAFT EQUIPMENT
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Strand, N. A., & Co., Chicago.

FLOODLIGHTS—Acetylene
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FLOOR PLATES—See Plates—Floor or Cellar Door

FLOORING—Acid Proof
Nukem Products Corp., 68 Niagara St. Buffalo, N. Y.

FLOORING—Monolithic
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St. New York City.

FLOORING—Open Steel
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.
Kerlow Steel Flooring Co., Jersey City, N. J.

FLUORSPAR
Hillside Fluor Spar Mines, Chicago, Ill.

FLUX—Welding
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FORGING MACHINES—Roll
Ajax Mfg. Co., The, Cleveland, Ohio.

FORGING MACHINES—Upset
Acme Machinery Co., The, Cleveland.
Ajax Mfg. Co., The, Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.

FORGINGS—Alloy Steel
Heppenstall Co., Pittsburgh.
Kropp Forge Co., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

FORGINGS—Brass, Bronze or Copper
American Brass Co., The, Waterbury, Conn.
Commonwealth Brass Corp., Detroit.
Cramp Brass & Iron Foundries Co., Philadelphia.
Titan Metal Mfg. Co., Bellefonte, Pa.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

FORGINGS—Coin Pressed
Rockford (Ill.) Drop Forge Co.

FORGINGS—Drop, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., Erie, Pa.
Billings & Spencer Co., Hartford, Conn.
Canton (Ohio) Drop Forging & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Kropp Forge Co., Chicago, Ill.
Poor & Co., Canton Forge & Axle Wks., Canton, Ohio
Rockford (Ill.) Drop Forge Co.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

FORGINGS—Hollow
Harrisburg (Pa.) Steel Corp.
Kropp Forge Co., Chicago, Ill.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Hydraulic Press, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem (Pa.) Steel Company.
Kropp Forge Co., Chicago, Ill.
Mesta Mch. Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa.
Standard Steel Wks. Co., Phila., Pa.

FORGINGS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

PRODUCTS INDEX

FORGINGS—Upset
Bethlehem (Pa.) Steel Company.
Kropp Forge Co., Chicago, Ill.
Lamson & Sessions Co., The, Cleveland.
Rockford (Ill.) Drop Forge Co.

FOUNDRY EQUIPMENT & SUPPLIES
Whiting Corp., Harvey, Ill.

FURNACES—Billet or Ingot Heating
Salem (Ohio) Engineering Co.

FURNACES—Brass Melting
Monarch Engineering & Mfg. Co., The, Baltimore, Md.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Electric, Steel Melting
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Pittsburgh (Pa.) Lectromelt Furnace Corp.

FURNACES—Enameling
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, Ohio.
General Electric Co., Schenectady, N. Y.

FURNACES—Forging
Electric Furnace Co., The, Salem, Ohio.
Holcroft & Co., Detroit.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Automatic
Amer. Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, Ohio.
Holcroft & Co., Detroit.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Rockwell, W. S., Co., 50 Church St., N.Y.C
R-S Products Corporation, Phila., Pa.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Cyanide or Lead
Electric Furnace Co., The, Salem, Ohio.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Electric
Electric Furnace Co., The, Salem, Ohio.
General Electric Co., Schenectady, N. Y.
Holcroft & Co., Detroit.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Rockwell, W. S., Co., 50 Church St., N.Y.C
R-S Products Corporation, Phila., Pa.
Salem (Ohio) Engineering Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES—Heat Treating, Oil or Gas
American Gas Furnace Co., Elizabeth, N. J.
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Electric Furnace Co., The, Salem, Ohio.
Holcroft & Co., Detroit.
Monarch Engineering & Mfg. Co., The, Baltimore, Md.
Pennsylvania Industrial Engineers, Pittsburgh.
R-S Products Corporation, Phila., Pa.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Open Hearth, Consultant
Lindemuth, Lewis B., 134 East 47th St., N. Y. C.

FURNACES—Pack Heating Sheets
Aetna-Standard Engineering Co., The Youngstown, Ohio.
Wean Engineering Co., Inc., The, Warren, Ohio.

FURNACES—Rivet Heating, Gas
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Wire, Annealing and Galvanizing
General Electric Co., Schenectady, N. Y.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

GAGE BLOCKS
Dearborn (Mich.) Gage Co.
Ford Motor Co. (C. E. Johansson Division), Dearborn, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

GAGES—Electric
Sheffield Gage Corp., Dayton, Ohio.

GAGES—Plug and Snap
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Gage Corp., Dayton, Ohio.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

GAGES—Pressure & Vacuum Recording
Brown Instrument Co., The, Philadelphia.

GAGES—Thickness, for Rolling Mills
Haines Gauge Co., The, Phila., Pa.

GAGES—Thread Lead
Jones & Lamson Mch. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Gage Corp., Dayton, Ohio.

GAGES—Temperature
Weston Electrical Instrument Corp., Newark, N. J.

GALVANIZING
Cattie, Joseph P., & Bros., Phila.

GALVANIZING PLANTS—For Sheets
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Erie (Pa.) Foundry Co.

GALVANIZING POTS
Pittsburgh (Pa.) Annealing Box Co.

GAS ANALYSIS RECORDERS
Brown Instrument Co., The, Philadelphia.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

GAS FOR INDUSTRIAL USES
American Gas Association, 420 Lexington Ave., N. Y. C.

GAS PRODUCERS
Koppers Co., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., & Co., Philadelphia.

GAS RECOVERY COKE OVENS
Koppers Co., Pittsburgh.

GASKETS—Asbestos, Metal or Rubber
Carey, Philip, Co., The, Cincinnati, Ohio.
Garlock Packing Co., The, Palmyra, N. Y.
Johns-Manville Corp., 22 East 40th St., New York City.

GASKETS—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.

GEAR CHECKING EQUIPMENT
Michigan Tool Co., Detroit, Mich.

GEAR CUTTING
Earle Gear & Machine Co., Phila.
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Gleason Works, Rochester, N. Y.
National-Erie Corp., Erie, Pa.
Philadelphia (Pa.) Gear Works.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

GEAR CUTTING MACHINES
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Gleason Works, Rochester, N. Y.

GEAR DRIVES—Herringbone
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Pitgh.

GEAR HOBBING MACHINES
Barber-Colman Co., Rockford, Ill.

GEAR LAPPING MACHINES
Michigan Tool Co., Detroit, Mich.

GEARMOTORS
Allis-Chalmers Mfg. Co., Milwaukee.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pitgh.

GEAR PLANNING MACHINES
Gleason Works, Rochester, N. Y.

GEAR SHAVING MACHINES
Michigan Tool Co., Detroit, Mich.

GEAR UNITS—Marine
Twin Disc Clutch Co., Racine, Wis.

GEARS—Bevel
Gleason Works, Rochester, N. Y.
National-Erie Corp., Erie, Pa.

GEARS—Heat Treated
Gleason Works, Rochester, N. Y.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Herringbone
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Mesta Mch. Co., Pittsburgh.
Philadelphia (Pa.) Gear Works.

GEARS—Machine Cut
Gleason Works, Rochester, N. Y.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Machine Molded
Poole Foundry & Mch. Co., Baltimore, Md.

GEARS—Non-Metallic
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

GEARS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

GEARS—Spur
Philadelphia (Pa.) Gear Works.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Steel, Silent
Waldron, John, Corp., New Brunswick, N. J.

GEARS—Worm
Philadelphia (Pa.) Gear Works.

GENERATORS—Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

GENERATORS—Electric
Chicago (Ill.) Electric Co.
Columbia Electric Mfg. Co., Cleveland, Ohio.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Pitgh.

GENERATORS—Electric, Second Hand. (See Clearing House Section)

GENERATORS—Plating
Columbia Electric Mfg. Co., Cleveland, Ohio.

GOGGLES—Safety
American Optical Co., Southbridge, Mass.
Willson Products, Inc., Reading, Pa.

GOVERNORS—Air Compressor
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

GRADUATING MACHINES—Metal
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

GRATING—Flooring, Sidewalk, etc.—See Flooring—Open Steel

GREASE—Lubricating
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.

PRODUCTS INDEX

Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

GRILLES—Metal Cane
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

GRILLES—Perforated Metal
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

GRINDERS—Carbide Tool
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

GRINDING AND POLISHING MACHINES
Black & Decker Mfg. Co., The, Towson, Md.
Bryant Machinery & Engineering Co., Chicago.
Excelsior Tool & Mch. Co., E. St. Louis, Ill
Norton Co., Worcester, Mass.

GRINDING MACHINES—Broach
Thompson Grinder Co., Springfield, Ohio.

GRINDING MACHINES—Centerless
Cincinnati (Ohio) Grinders Incorporated.

GRINDING MACHINES—Chucking
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING MACHINES — Cutter & Reamer
Cincinnati (Ohio) Milling Mch. Co., The.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Machine Tool Co., Cincinnati.

GRINDING MACHINES—Cylinder
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Cylindrical
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati (Ohio) Grinders Incorporated.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Die
Landis Mch. Co., Inc., Waynesboro, Pa.

GRINDING MACHINES—Gear & Worm
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

GRINDING MACHINES—Hob
Barber-Colman Co., Rockford, Ill.

GRINDING MACHINES—Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Greenfield (Mass.) Tap & Die Corp.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Internal, Centerless
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Internal Multiple Spindle
Baird Mch. Co., The, Bridgeport, Conn.

GRINDING MACHINES — Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

GRINDING MACHINES—Portable Flexible Shaft
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Strand, N. A., & Co., Chicago.

GRINDING MACHINES—Portable Pneumatic
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Ingersoll-Rand Co., 11 Broadway, New York City.
Warner & Swasey Co., The, Cleveland.

GRINDING MACHINES—Precision Thread
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.
Jones & Lamson Machine Co., Springfield, Vt.

GRINDING MACHINES—Roll
Cincinnati (Ohio) Grinders Incorporated.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Snagging
Black & Decker Mfg. Co., The, Towson, Md.

GRINDING MACHINES—Surface
Abrasive Machine Tool Co., E. Prov., R. I.
Blanchard Machine Co., The, Cambridge, Mass.
Heald Machine Co., Worcester, Mass.
Norton Co., Worcester, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Thompson Grinder Co., Springfield, Ohio.

GRINDING MACHINES—Swing Frame
Black & Decker Mfg. Co., The, Towson, Md.
Shuster, F. B., Co., The, New Haven, Conn.

GRINDING MACHINES—Tool
Cincinnati (Ohio) Milling Mch. Co., The.
Gisholt Machine Co., Madison, Wis.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Universal
Cincinnati (Ohio) Grinders Incorporated.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.
Thompson Grinder Co., Springfield, Ohio.

GRINDING MACHINES—Valve
Landis Tool Co., Waynesboro, Pa.

GRINDING WHEELS
Bakelite Corp., 247 Park Ave., New York City.
Blanchard Machine Co., The, Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Macklin Company, Jackson, Mich.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.
Norton Co., Worcester, Mass.

GRINDING WHEELS—Segment
Blanchard Machine Co., The, Cambridge, Mass.

GRIT—Steel
Harrison Abrasive Corp., Manchester, N. H.
Pittsburgh (Pa.) Crushed Steel Co.

HACK SAW BLADES—See Saws—Hack Saw Blades

HACK SAW MACHINES
Armstrong-Blum Mfg. Co., Chicago.

HAMMER BOARDS
Irwin, H. G., Lumber Co., Erie, Pa.

HAMMERS—Air, Forging
Chambersburg (Pa.) Engineering Co.
Nazel Engineering & Machine Works, Philadelphia.

HAMMERS—Chipping & Riveting—Pneumatic
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS—Drop
Billings & Spencer Co., Hartford, Conn.
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Morgan Engineering Co., The, Alliance, O.

HAMMERS—Helve
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

HAMMERS—Pneumatic
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.

HAMMERS—Power
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

HAMMERS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., 1306 Elston Ave.

HAMMERS—Steam
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Morgan Engineering Co., The, Alliance, O.

HANGER BEARINGS
Dodge Mfg. Corp., Mishawaka, Ind.

HANGERS—Ball Bearing
S K F Industries, Inc., Front St. & Erie Ave., Phila., Pa.

HANGERS—Pressed Steel
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.

HANGERS—Roller Bearing
Hyatt Bearings Div. General Motors Corp., Newark, N. J.

HANGERS—Shaft
Dodge Mfg. Corp., Mishawaka, Ind.
Wood's, T. B., Sons Co., Chambersburg, Pa.

HEADING MACHINES
Ajax Mfg. Co., The, Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.

HEADING MACHINES—Automatic, Electric
National Machinery Co., Tiffin, Ohio.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

HEADS—Spun and Pressed
Worth Steel Co., Claymont, Del.

HEAT TREATING
Barnes-Gibson-Raymond, Detroit Plant Div. of Associated Spring Corp.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
General Machine Wks., York, Pa.
Gibson, Wm. D., Co., Div. of Associated Spring Corp., Chicago.
Parish Pressed Steel Co., Reading, Pa.
Pennsylvania Industrial Engineers, Pittsburgh.

HEAT TREATING EQUIPMENT — Air Draw
Herrington & Randall, Inc., Detroit.

HEATERS—Unit
Buffalo (N. Y.) Forge Co., 492 Broadway.

HELMETS AND HANDSHIELDS—Welding
Willson Products, Inc., Reading, Pa.

HOBS
Barber-Colman Co., Rockford, Ill.

HOISTS—Air
Detroit (Mich.) Hoist & Mach. Co.
Ingersoll-Rand Co., 11 Broadway, N. Y. C.
Northern Engineering Works, Detroit.

HOISTS—Chain
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

HOISTS—Electric
American Engineering Co., Philadelphia.
Detroit (Mich.) Hoist & Mach. Co.
Euclid Crane & Hoist Co., The, Euclid, O.

PRODUCTS INDEX

Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Northern Engineering Works, Detroit, Mich.
Philadelphia (Pa.) Gear Works
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

HOISTS—Electric Traveling
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

HOISTS—Monorail
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HONING MACHINES
Micromatic Hone Corp., Detroit.

HOSE—Air, Oil, Steam and Water
Hewitt Rubber Corp., Buffalo, N. Y.
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

HOSE—Flexible Metallic
American Brass Co., The, Waterbury, Conn.
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

HOSE—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

HYDRANTS—Fire
Wood, R. D., & Co., Philadelphia.

HYDRAULIC FEEDS
Vickers, Inc., 1420 Oakman Blvd., Detroit.

HYDRAULIC MACHINERY
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Denison Engineering Co., The, Columbus, Ohio.
Farquhar, A. B., Co., Ltd., York, Pa.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

HYDRAULIC POWER UNIT
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

INGOT MOLDS
Shenango-Penn Mold Co., Dover, Ohio.

INGOTS—Aluminum
Aluminum Co. of America, Pittsburgh.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.

INSTRUMENTS—Electric
General Electric Co., Schenectady, N. Y.
Weston Electrical Instrument Corp., Newark, N. J.

INSTRUMENTS—Recording
Brown Instrument Co., The, Philadelphia.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

INSULATION
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St., New York City.

IRON—Rustless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

IRON WORKERS—Universal
Buffalo (N. Y.) Forge Co., 492 Broadway.

JIGS, FIXTURES, DIES, etc. (See Dies, Jigs, Fixtures, etc.)

KEYS—Riveted
Western Wire Prods. Co., St. Louis, Mo.

KEYSEATING MACHINES
Baker Bros., Inc., Toledo, Ohio.
Davis Keyseater Co., 400 Exchange St., Rochester, N. Y.

LACING—Belt, Rawhide or Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LAMPS—Filament
General Electric Co., Cleveland.

LAMPS—Mercury Vapor
General Electric Vapor Lamp Co., Hoboken, N. J.

LAPPING MACHINES
Cincinnati (Ohio) Grinders Incorporated.

LATHES—Automatic
Baird Mch. Co., The, Brideport, Conn.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Goss & De Leeuw Mch. Co., New Britain, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
R. I.
LeBlond, R. K., Mch. Tool Co., Cincinnatti.
Monarch Mch. Tool Co., The, Sidney, O.
Potter & Johnston Machine Co., Pawtucket,

LATHES—Automatic Vertical
Baird Mch. Co., The, Bridgeport, Conn.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.

LATHES—Bench
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston, Mass.

LATHES—Brass
Warner & Swasey Co., The, Cleveland.

LATHES—Chucking
Jones & Lamson Mch. Co., Springfield, Vt.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., The, Cleveland.

LATHES—Contour Turning
Monarch Mch. Tool Co., The, Sidney, O.

LATHES—Crankshaft
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Potter & Johnston Machine Co., Pawtucket, R. I.

LATHES—Engine
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Lathe & Tool Co.
Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.

LATHES—Roll
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

LATHES — Second-Hand. (See Clearing House Section)

LATHES—Toolroom
Cincinnati (Ohio) Lathe & Tool Co.
LeBlond, R. K., Machine Tool Co., Cincinnati, Ohio.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

LATHES—Turret
Bardons & Oliver, Cleveland.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Mch. Co., Springfield, Vt.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., The, Cleveland.

LATHES, Turret, Vertical
Bullard Co., The, Bridgeport, Conn.

LAYOUT FLUID
Dayton Rogers Mfg. Co., Minneapolis, Minn.

LEAD LININGS
National Lead Co., 111 Bdway., N. Y. C.

LEAD—In Oil
National Lead Co., 111 Bdway., N. Y. C.

LEAD—Tellurium
National Lead Co., 111 Bdway., N. Y. C.

LEATHER—Cup
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LEVELING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
McKay Machine Co., The, Youngstown, Ohio.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Wean Engineering Co., Inc., The, Warren, O.

LOCOMOTIVES—Electric
Atlas Car & Mfg. Co., The, Cleveland.
Davenport (Iowa) Locomotive Works, a Division of Davenport Besler Corp.

LOCOMOTIVES—Gas-Electric
Davenport (Iowa) Locomotive Works, a Division of Davenport Besler Corp.

LOCOMOTIVES—Gasoline
Plymouth (Ohio) Locomotive Wks.

LOCOMOTIVES—Industrial
Davenport (Iowa) Locomotive Works, a Division of Davenport Besler Corp.
Plymouth (Ohio) Locomotive Wks.

LOCOMOTIVES—Steam
Iron & Steel Products, Inc., Chicago.

LOCOMOTIVES—Storage Battery
Atlas Car & Mfg. Co., The, Cleveland.

LUBRICANTS—Crusher & Grinding
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Gear
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

PRODUCTS INDEX

LUBRICANTS—High Pressure & Temperature
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Mine Cars
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Mining Machines
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Railroad
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Roll Neck—Anti-Friction & Plain
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 E. 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Tipple & Cleaning
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco; Shell Bldg., St. Louis, and 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

MACHINE WORK
Dodge Mfg. Corp., Mishawaka, Ind.
General Machine Works, York, Pa.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

MACHINERY DEALERS—Second-Hand (See Clearing House Section)

MACHINISTS' SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.

MAGNESITE—Brick or Dead Burnt
Carborundum Co., The, Perth Amboy, N. J.

MAGNESIUM
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

MAGNETS—Lifting
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 727 Smith St., Milwaukee.
Electric Controller & Mfg. Co., The, Cleve.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.

MAGNETS — Separating—See Separators—Magnetic

MALLETS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

MANDRELS—Expanding
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

MANHOLE FITTINGS AND SADDLES
Worth Steel Co., Claymont, Del.

MANIFOLDS—Oxygen & Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

MARKING MACHINES
Noble & Westbrook Mfg. Co., The, East Hartford, Conn.

METAL NAME PLATES
Grammes, L. F., & Sons, Inc., Allentown, Pa.

METAL SPECIALTIES
Crosby Co., The, Buffalo, N. Y.
Dinsmore & Jager, Northampton, Mass.
Grammes, L. F., & Sons, Inc., Allentown, Pa.
Torrington (Conn.) Company.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.
York (Pa.) Corrugating Co.

METERS—Electric Welding
Lincoln Electric Co., The, Cleveland.

METERS—Flow
Brown Instrument Co., The, Philadelphia.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

METERS—Water & Oil
Worthington Pump & Machinery Corp., Harrison, N. J.

MICROMETERS—Dial for Sheet Metal
Haines Gauge Co., The, Phila., Pa.

MILLING MACHINES—Automatic
Cincinnati (Ohio) Milling Mch. Co., The.
Potter & Johnston Machine Co., Pawtucket, R. I.

MILLING MACHINES—Horizontal
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
Potter & Johnston Machine Co., Pawtucket, R. I.

MILLING MACHINES—Planer Type
Cincinnati (Ohio) Planer Co.

MILLING MACHINES — Second - Hand. (See Clearing House Section)

MILLING MACHINES—Vertical
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
Potter & Johnston Machine Co., Pawtucket, R. I.
Reed-Prentice Corp., Worcester, Mass.

MOLDING MACHINES
Tabor Mfg. Co., Phila., Pa.

MONEL METAL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.

MONORAIL SYSTEMS—Hand & Electric
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

MOTOR GENERATOR SETS
Columbia Electric Mfg. Co., Cleveland, Ohio.

MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.
Chicago (Ill.) Electric Co.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Howell (Mich.) Electric Motors Co.
Lincoln Electric Co., Cleveland.
Westinghouse Elec. & Mfg. Co., E. Ptgh.

MOTORS—Electric, Second-Hand. (See Clearing House Section)

NAILS—Wire
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Hassall, John, Inc., Clay & Oakland Sts., Bklyn., N. Y.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Youngstown (Ohio) Sheet & Tube Co., The.

NIBBLING MACHINES
Gray Machine Co., Philadelphia.

NICKEL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.

NICKEL-PLATING
Bright Nickel Corp., Detroit, Mich.

NITROGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.

NOZZLES—Sand Blasting
Norton Co., Worcester, Mass.

NUMBERING MACHINES—For Metal
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

NUT MACHINERY
Denison Engineering Co., The, Columbus, Ohio.

NUT MACHINERY — Automatic Cold Pressed
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

NUT MAKING MACHINERY
National Machinery Co., Tiffin, Ohio.

NUTS—Castellated
National Acme Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Lock
Standard Pressed Steel Co., Jenkintown, Pa.

NUTS—Machine Screw
Progressive Mfg. Co., Torrington, Conn.

NUTS—Semi-Finished
Cleveland (Ohio) Cap Screw Co., The.
Ohio Nut & Bolt Co., The, 614 Front St., Berea, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

OIL & GREASE SEALS
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Garlock Packing Co., The, Palmyra, N. Y.

OIL RETAINERS
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

OIL STONES
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

PRODUCTS INDEX

OILS—Cutting
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago, Ill.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Fuel
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Standard Oil Co. (Indiana), Chicago, Ill.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Lubricating
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Texas Company, The, 135 East 42nd St. N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Soluble—See Oils—Cutting

ORES—Iron
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Hanna Furnace Corp., The, Detroit, Mich.
Pickands Mather & Co., Cleveland.

OVENS—Coke and By-Product Recovery
Koppers Co., Pittsburgh.

OVENS—Core and Mold
Herrington & Randall, Inc., Detroit.
Holcroft & Co., Detroit.
Monarch Engineering & Mfg. Co., The, Baltimore, Md.

OVENS—Cross Regenerative
Koppers Co., Pittsburgh.

OVENS—Enameling and Japanning
Carborundum Co., The, Perth Amboy, N. J.
Herrington & Randall, Inc., Detroit.

OXY-ACETYLENE — Shape-Cutting Machines
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

OXYGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

PACKING—Felt
American Felt Co., 315 Fourth Ave., N. Y. C.

PACKING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Garlock Packing Co., The, Palmyra, N. Y.

PACKING—Locomotive Cylinder
Koppers Co., American Hammered Piston Ring Div., Baltimore, Md.

PACKING—Metallic
Garlock Packing Co., The, Palmyra, N. Y.

PACKING—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

PACKING—Sheet, Asbestos or Rubber
Carey, Philip, Co., The, Cincinnati, Ohio.
Garlock Packing Co., The, Palmyra, N. Y.
Hewitt Rubber Corp., Buffalo, N. Y.
Johns-Manville Corp., 22 East 40th St., New York City.

PAINT
Carey, Philip, Co., The, Cincinnati, Ohio.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
National Lead Co., 111 Bdway., N. Y. C
Sipe, James B., & Co., Pittsburgh.

PARALLELS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

PERFORATED METAL
Chicago Perforating Co., 2440 W 24th Place, Chicago, Ill.
Erdle Perforating Co., Rochester, N. Y
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa

PICKLING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Mesta Mch. Co., Pittsburgh.

PICKLING TANK LININGS
Cellcote Co., The, Cleveland.
Heil & Co., Cleveland.
National Lead Co., 111 Bdway., N. Y. C.

PICKLING TANK STEAM JETS
Durion Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
Heil & Co., Cleveland.

PIG IRON
Bethlehem (Pa.) Steel Co.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Hanna Furnace Corp., The, Detroit, Mich.
Jackson (Ohio) Iron & Steel Co., The.
Pickands Mather & Co., Cleveland.
Republic Steel Corp., Cleveland, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

PILING—Steel Pipe
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PILING—Steel Sheet
American Rolling Mill Co., Middletown, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

PILLOW BLOCKS
Dodge Mfg. Corp., Mishawaka, Ind.

PINIONS—Rolling Mill
Mesta Mch. Co., Pittsburgh.

PINIONS—Wire and Rod
Rathbone, A. R. & J., Palmer, Mass.

PINS—Cotter
Lamson & Sessions Co., The, Cleveland.

PIPE—Cast Iron, B. & S. and Flanged
Wood, R. D., & Co., Philadelphia.

PIPE—Hammer Welded
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PIPE—Lead
National Lead Co., 111 Bdway., N. Y. C.

PIPE—Lead Lined
National Lead Co., 111 Bdway., N. Y. C.

PIPE—New and Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.

PIPE—Seamless Brass or Copper
American Brass Co., The, Waterbury, Conn.

PIPE—Spiral Welded
American Rolling Mill Co., Middletown, O.
Crane Co., Chicago.

PIPE—Standard, Black and Galvanized
Bethlehem (Pa.) Steel Co.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Youngstown (Ohio) Sheet & Tube Co., The.

PIPE—Welded, Electric
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.

PIPE COVERING—Asbestos
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St., New York City.

PIPE FITTINGS
Crane Co., Chicago.
Jarecki Mfg. Co., Erie, Pa.

PIPE THREADING & CUTTING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Cox & Sons Co., The, Bridgeton, N. J.
Jarecki Mfg. Co., Erie, Pa.
Landis, Mach. Co., Inc., Waynesboro, Pa.
Merrell Mfg. Co., Toledo.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

PISTON RINGS
Koppers Co., American Hammered Piston Ring Div., Baltimore, Md.

PLANERS
Cincinnati (Ohio) Planer Co.

PLANERS—Rotary
Espen-Lucas Mch. Wks., Philadelphia.

PLANING MACHINES — Second Hand. (See Clearing House Section)

PLASTICS—Laminated
Bakelite Corp., 247 Park Ave., New York City.

PLASTICS—Moulded
Bakelite Corp., 247 Park Ave., New York City.

PLASTICS—Synthetic
Bakelite Corp., 247 Park Ave., New York City.

PLATER'S CLEANING COMPOUND
American Chemical Paint Co., Ambler, Pa.

PLATES—Floor or Cellar Door
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Inland Steel Co., Chicago.

PLATES—Iron or Steel
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Ryerson, Joseph T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.
Worth Steel Co., Claymont, Del.
Youngstown (Ohio) Sheet & Tube Co., The.

PLATFORMS—Skid
Standard Pressed Steel Co., Jenkintown Pa.

PLUGS—Core Hole
Hubbard, M. D., Spring Co., 745 Central Ave., Pontiac, Mich.

PRODUCTS INDEX

POLISHING & BUFFING MACHINES—Automatic
Packer Machine Co., The, Meriden, Conn.

POLISHING MACHINES
Packer Machine Co., The, Meriden, Conn.

POLISHING MACHINES—Bar
Medart Co., The, St. Louis, Mo.

POWER TAKE-OFF UNITS
Twin Disc Clutch Co., Racine, Wis.

POWER TRANSMITTING MACHINERY
Dodge Mfg. Corp., Mishawaka, Ind.
Wood's, T. B., Sons Co., Chambersburg, Pa.

POWER UNITS—Rotary
Cushman Chuck Co., Hartford, Conn.
New Departure Div., General Motors Corp., Bristol, Conn.

POWER UNITS—Straight Line
Cushman Chuck Co., Hartford, Conn.

PRECIPITATORS—Electrostatic Dust
Pangborn Corporation, Hagerstown, Md.

PRESS BRAKES — See Brakes — Metal Forming

PRESS FEEDS—Automatic
Littell, F. J., Mch. Co., Chicago.

PRESSED METAL PARTS
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.

PRESSED STEEL PARTS
Crosby Co., The, Buffalo, N. Y.
Lansing (Mich.) Stamping Co., So. Penn Ave.
Parish Pressed Steel Co., Reading, Pa.
Stanley Works, The, New Britain, Conn.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
York (Pa.) Corrugating Co.

PRESSES—Automatic
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Mfg. Co., The, Hartford, Conn.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PRESSES—Baling, Hydraulic
Baldwin-Southwark Corp., Southwark Div. Philadelphia.

PRESSES—Broaching
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Coining
Ferracute Machine Co., Bridgeton, N. J.
General Machinery Corp., Hamilton, Ohio.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Minster (Ohio) Machine Co.
National Machinery Co., Tiffin, Ohio.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Die Sinking
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Drawing
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Drop—See Hammers—Drop

PRESSES—Embossing
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Extrusion
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Foot
Baird Mch. Co., The, Bridgeport, Conn.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

PRESSES—Forging
Ajax Mfg. Co., The, Cleveland, Ohio.
Chambersburg (Pa.) Engineering Co.
Ferracute Machine Co., Bridgeton, N. J.
General Machinery Corp., Hamilton, Ohio.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Forming and Bending
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Farquhar, A. B., Co., Ltd., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
General Machinery Corp., Hamilton, Ohio.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Minster (Ohio) Machine Co.
Niagara Mch. & Tool Wks., Buffalo, N. Y.
U. S. Tool Co., Inc., Ampere, N. J.

PRESSES—Friction Screw
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Hydraulic
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Chambersburg (Pa.) Engineering Co.
Farquhar, A. B., Co., Ltd., York, Pa.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hannifin Mfg. Co., Chicago.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

PRESSES—Metal Extrusion
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Plastics Molding
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Power
Baird Mch. Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Shaper Co., The.
Farrel-Birmingham Co., Inc., Ansonia Conn.
Ferracute Machine Co., Bridgeton, New Jersey.
General Machinery Corp., Hamilton, Ohio.
Hyman, Joseph, & Sons, Phila.
Minster (Ohio) Machine Co.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Machine & Tool Wks., Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Thomas Machine Mfg. Co., Pittsburgh.
U. S. Tool Co., Inc., Ampere, N. J.
V & O Press Co., Hudson, N. Y.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Stamping
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Straightening
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Trimming
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
General Machinery Corp., Hamilton, Ohio.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PULLEYS—Friction Clutch
Dodge Mfg. Corp., Mishawaka, Ind.

PULLEYS—Iron, Solid & Split
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.
Dodge Mfg. Corp., Mishawaka, Ind.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Wood's, T. B., Sons Co., Chambersburg, Pa.

PULLEYS—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

PULVERIZERS
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.
Whiting Corp., Harvey, Ill.

PUMPS—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

PUMPS—Boiler Feed
Ingersoll-Rand Co. (Cameron), 11 Broadway, N. Y. C.

PUMPS—Centrifugal
Ingersoll-Rand Co. (Cameron), 11 Broadway, N. Y. C.
Ruthman Machinery Co., Cincinnati.
Tomkins-Johnson Co., The, Jackson, Mich.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS—Coolant
Ruthman Machinery Co., Cincinnati.

PUMPS—Hydraulic
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS—Power
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS—Power Transmission
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Vickers, Inc., 1420 Oakman Blvd., Detroit.

PUMPS—Hydraulic Radial—Variable Reversible Delivery
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PUMPS—Rotary
Vickers, Inc., 1420 Oakman Blvd., Detroit.

PUMPS—Rotary Positive, Centrifugal & Turbine
Crane Co., Chicago.

PUMPS—Steam
Ingersoll-Rand Co. (Cameron), 11 Broadway, N. Y. C.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS—Vacuum
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES & DIES
Cleveland Steel Tool Co., The, 660 E. 82d St., Cleveland, Ohio.

PUNCHING AND SHEARING MACHINES
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 Broadway.
Cincinnati (Ohio) Shaper Co., The.
Excelsior Tool & Mach. Co., E. St. Louis, Ill.
Niagara Machine & Tools Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Thomas Mach. Mfg. Co., Pittsburgh.

PYROMETERS—Indicating
Brown Instrument Co., The, Philadelphia.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

RAILS
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

PRODUCTS INDEX

Foster, L. B., Co., Inc., Pittsburgh.
Frank, M. K., 480 Lexington Ave., N. Y. C.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

RAILS—Relaying
Hyman-Michaels Co., Chicago.
Iron & Steel Products, Inc., Chicago.
Sherwood, E. C., 50 Church St., N. Y. C.

RAILWAY EQUIPMENT & SUPPLIES
Iron & Steel Products, Inc., Chicago.
Pettibone Mulliken Corp., Chicago.

REAMING MACHINES
Blanchard Machine Co., The, Cambridge, Mass.

REAMERS
Cleveland (Ohio) Twist Drill Co., The.
Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

REAMERS—Expansion
Apex Machine & Tool Co., The, Dayton, Ohio.
Barber-Colman Co., Rockford, Ill.

RECORDERS—Furnace Atmosphere
Brown Instrument Co., The, Philadelphia.

REELS—For Coil Stock
Littell, F. J., Mch. Co., Chicago.

REFRACTORIES
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
Cleveland (Ohio) Quarries Co., The.
Illinois Clay Products Co., Joliet, Ill.

REGULATORS—Compressed Gas
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

REINFORCEMENT FABRIC—Concrete
Pittsburgh (Pa.) Steel Co.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

RESPIRATORS
Willson Products, Inc., Reading, Pa.

RIDDLES—Foundry
Ludlow-Saylor Wire Co., St. Louis, Mo.

RINGS—Iron or Steel
Kropp Forge Co., Chicago, Ill.
Midvale Co., The, Nicetown, Phila., Pa.
Standard Steel Wks. Co., Phila., Pa.

RINGS—Welded
American Welding & Mfg. Co., Warren, Ohio.
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

RIVET MAKING MACHINERY
Acme Machinery Co., The, Cleveland.
National Machinery Co., Tiffin, Ohio.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

RIVET SETS
Cleveland Steel Tool Co., The, 660 E. 82d St., Cleveland, Ohio.

RIVETING HAMMERS
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

RIVETING MACHINES
Hanniffin Mfg. Co., Chicago.
Shuster, F. B., Co., The, New Haven, Ct.
Tomkins-Johnson Co., The, Jackson, Mich.
Tubular Rivet & Stud Co., Wollaston, Mass.

RIVETS
American Screw Co., Providence, R. I.
Clark Bros. Bolt Co., Millidale, Conn.
Hassall, John, Inc., Clay & Oakland Sts., Bklyn., N. Y.
Progressive Mfg. Co., Torrington, Conn.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tubular Rivet & Stud Co., Wollaston, Mass.

ROCK BITS
Timken Roller Bearing Co., Canton, Ohio.

RODS—Aluminum
Aluminum Co. of America, Pittsburgh.

RODS—Brass
American Brass Co., The, Waterbury, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

RODS—Connecting
Kropp Forge Co., Chicago, Ill.

RODS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave. Midland, Mich.

RODS—Nickel Silver
American Brass Co., The, Waterbury, Conn.

RODS—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.

RODS—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

RODS—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Pittsburgh (Pa.) Steel Co.
Titan Metal Mfg. Co., Bellefonte, Pa.

RODS—Wire
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Co.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.
Youngstown (Ohio) Sheet & Tube Co., The.

ROLLING MACHINERY—Cold Rolling
Cold Metal Process Co., The, Youngstown, Ohio.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

ROLLING MACHINERY—Sheet Metal
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.

ROLLING MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Cold Metal Process Co., The, Youngstown, Ohio.
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Farrel-Birmingham Co., Inc., Ansonia, Ct.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
McKay Machine Co., The, Youngstown, Ohio.
Mesta Mch. Co., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Fdry. Co., Avonmore, Pa.
United Engineering & Fdry. Co., Ptgh.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

ROLLING MILLS—Copper Rod & Sheet
Torrington (Conn.) Mfg. Co., The.

ROLLS—Alloy Steel
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Ohio Steel Foundry Co., Lima, Ohio.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.

ROLLS—Bending and Straightening
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Bertsch & Co., Cambridge City, Ind.
Kane & Roach, Inc., Syracuse, N. Y.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
McKay Machine Co., The, Youngstown, Ohio.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

ROLLS—Rubber Covered
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

ROLLS—Sand Chilled Iron and Steel
Aetna-Standard Engineering Co., The Youngstown, Ohio.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
National Roll & Fdry. Co., Avonmore, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

ROLLS—Special Hardened
Bethlehem (Pa.) Steel Co.
Midvale Co., The Nicetown, Phila., Pa.

ROOFING MATERIALS
Carey, Philip, Co., The, Cincinnati, Ohio.

ROOFING—Coal Tar Pitch
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

ROOFING—Special Copper Bearing Steel
Superior Sheet Steel Co., Canton, Ohio.

ROOFING AND SIDING—Corrugated and Plain
American Rolling Mill Co., Middletown, O.
Carey, Philip, Co., The, Cincinnati, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Johns-Manville Corp., 22 East 40th St., New York City.
Jones & Laughlin Steel Corp., Pittsburgh.
Weirton (W. Va.) Steel Co.

ROOFING AND SIDING—Iron and Steel
Inland Steel Co., Chicago.

ROOFING & SIDING—(Zinc)—Corrugated & Plain
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

RUBBER LININGS
Goodrich, B. F., Co., The, Akron, Ohio.

RUBBER MOLDED PARTS
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING COMPOUNDS
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING PROCESS
American Chemical Paint Co., Ambler, Pa.
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

SAND BLAST EQUIPMENT & MACHINES
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.

SAND BLAST STEEL SHOT
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Harrison Abrasive Corp., Manchester, N. H.
Pittsburgh (Pa.) Crushed Steel Co.

PRODUCTS INDEX

SAND RAMMERS
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

SAWING MACHINES—Metal
Espen-Lucas Mch. Works, Phila.

SAWING MACHINES—Metal—Band
Grob Brothers, Grafton, Wis.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Circular, Rip & Cutoff
Atkins, E. C., & Co., Indianapolis.

SAWS—Friction
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia

SAWS—Hack Saw Blades
Atkins, E. C., & Co., Indianapolis.
Millers Falls Co., Greenfield, Mass.

SAWS—Hot Metal
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Inserted Tooth, Cold
Disston, Henry, & Sons, Inc., Philadelphia.
Tabor Mfg. Co., Philadelphia.

SAWS—Milling
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.

SAWS—Screw Slotting
Barber-Colman Co., Rockford, Ill.

SCALES
Streeter-Amet Co., Chicago.

SCRAP BUNDLING MACHINES—Metal
Cox & Sons Co., The, Bridgeton, N. J.

SCREENS—Perforated Metal
Chicago Perforating Co., 2440 W. 24th Place, Chicago, Ill.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

SCREENS—Woven Wire
Ludlow-Saylor Wire Co., St. Louis, Mo.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SCREW DRIVER BITS—Recessed Head Type
Apex Machine & Tool Co., The, Dayton, Ohio.

SCREW DRIVERS—Recessed Head Type
Apex Machine & Tool Co., The, Dayton, Ohio.

SCREW MACHINE PRODUCTS
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Commonwealth Brass Corp., Detroit.
Eastern Mch. Screw Corp., New Haven.
National Acme Co., The, Cleveland.
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.

SCREW MACHINERY—Automatic
Brown & Sharpe Mfg. Co., Providence R. I.
National Acme Co., The, Cleveland.
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

SCREW MACHINERY—Hand
Warner & Swasey Co., The, Cleveland.

SCREW MACHINERY—Multiple Spindle
National Acme Co., The, Cleveland.

SCREW STOCK
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SCREWS—Cap
Cleveland (Ohio) Cap Screw Co., The.
Lamson & Sessions Co., The, Cleveland.
National Acme Co., The, Cleveland
Ottemiller, Wm. H., Co., Inc., York, Pa.
Tripiex Screw Co., Cleveland.

SCREWS—Coach or Lag
Lamson & Sessions Co., The, Cleveland.

SCREWS—Machine
Lamson & Sessions Co., The, Cleveland.
Progressive Mfg. Co., The, Torrington Ct.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
Tripiex Screw Co., Cleveland.

SCREWS—Machine, Recessed Head
American Screw Co., Providence, R. I.

SCREWS—Safety Set
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Set
Cleveland (Ohio) Cap Screw Co., The.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.

SCREWS—Sheet Metal, Recessed Head
American Screw Co., Providence, R. I.

SCREWS, Socket, Head, Cap
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Wood, Recessed Head
American Screw Co., Providence, R. I.

SCRIBERS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

SCRUBBING MACHINES—Sheet
Wean Engineering Co., Inc., The, Warren, Ohio.

SCYTHE STONES AND WHETSTONES
Carborundum Co., The, Niagara Falls, N.Y.

SECOND - HAND MACHINERY—(See Clearing House Section)

SEPARATORS—Magnetic
Dings Magnetic Separator Co., 727 Smith St., Milwaukee.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

SHAFTING—Cold Drawn
LaSalle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

SHAFTING—Forged
Bay City Forge Co., Erie, Pa.

SHAFTING—Steel
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SHAFTING—Turned and Ground
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

SHAPERS
Cincinnati (Ohio) Shaper Co., The.

SHAPERS—Vertical
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

SHAPES—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

SHAPES—Wire
American Spring & Mfg. Corp., Holly, Mich.
Cuyahoga Spring Co., The, Cleveland.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Grammes, L. F., & Sons, Inc., Allentown, Pa.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Roebling's, John A. Sons Co., Trenton, N. J.

SHEAR BLADES & KNIVES
American Shear Knife Co., Homestead, Pa.
Canton Fdry. & Mch. Co., Cleveland.
Heppenstall Co., Pittsburgh.

SHEARING MACHINES—Alligator
Canton Fdry. & Mch. Co., Cleveland.

SHEARING MACHINES—Angle, Hand and Power
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y

SHEARING MACHINES—Bar
Buffalo (N. Y.) Forge Co., 492 Broadway.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
United Engineering & Fdry. Co., Pigh.

SHEARING MACHINES — Beam and Channel
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Pigh.

SHEARING MACHINES—Billet
Morgan Engineering Co., The, Alliance, O.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Thomas Machine Mfg. Co., Pittsburgh.
United Engineering & Fdry. Co., Pigh.

SHEARING MACHINES — Continuous Sheet & Pack
Aetna-Standard Engineering Co., The, Youngstown, Ohio.

SHEARING MACHINES—Plate
Bertsch & Co., Cambridge City, Ind.
Cincinnati (Ohio) Shaper Co., The.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y
Thomas Machine Mfg. Co., Pittsburgh.
United Engineering & Fdry. Co., Pigh.

SHEARING MACHINES — Sheet and Plate
Cincinnati (Ohio) Shaper Co., The.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEARING MACHINES—Squaring
Cincinnati (Ohio) Shaper Co., The.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEET LIFTERS
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.

SHEET METAL MACHINERY
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Ferracute Machine Co., Bridgeton, New Jersey.
Kane & Roach, Inc., Syracuse, N. Y.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Y & O Press Co., Hudson, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

SHEET METAL WORK
York (Pa.) Corrugating Co.

SHEETS—Aluminum
Aluminum Co. of America, Pittsburgh.

SHEETS—Auto Body
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Inland Steel Co., Chicago.

PRODUCTS INDEX

Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Black
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Granite City (Ill.) Steel Co.
Ingersoll Steel & Disc Co., Chicago.
Inland Steel Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Detroit.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.
Worth Steel Co., Claymont, Del.

SHEETS—Brass, Bronze, Copper, Nickel, Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.

SHEETS—Chrome
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Chrome Nickel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Cold Rolled
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Copper Alloy
American Brass Co., The Waterbury, Conn.

SHEETS—Copper Steel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.

SHEETS—Electrical
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Enameling
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.

SHEETS—For Drawing and Stamping
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Superior Sheet Steel Co., Canton, Ohio.
Worth Steel Co., Claymont, Del.

SHEETS—Full Finished
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Galvanized, Flat and Corrugated
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Lead
National Lead Co., 111 Bdway., N. Y. C.

SHEETS—Long Terne
American Rolling Mill Co., Middletown, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

SHEETS—Metal Furniture
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Pickled
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Tin Mill Black
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.

SHEETS—Zinc
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

SHOP FURNITURE
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

SHOVELS—Mounted—See Cranes

SHUTTERS—Steel & Wood Bi-Folding
Kinnear Mfg. Co., Columbus, Ohio.

SILICO—MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SILICON METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SINE BARS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

SLINGS—Wire Rope
Roebling's, John A., Sons Co., Trenton, N. J.

SLITTERS—Gang
McKay Machine Co., The, Youngstown, Ohio.

SLOTTING MACHINES
Nazel Engineering & Machine Works, Phila.

SOAKING PITS
Amsler-Morton Co., Pittsburgh.

SOLDER—Flux-Filled
Gardiner Metal Co., 4884 S. Campbell Ave., Chicago.

SOLVENTS—Oil & Grease
Detroit Rex Products Co., Detroit, Mich.

SPECIAL MACHINERY
Baldwin-Southwark Corp., Southwark Div. Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Bullard Co., The, Bridgeport, Conn.
Denison Engineering Co., The, Columbus, Ohio.
Dodge Mfg. Corp., Mishawaka, Ind.
Fastern Tool & Mfg. Co., Bloomfield, N. J.
Morgan Engineering Co., The, Alliance, O.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.
Thomas Mch. Mfg. Co., Pittsburgh.
Wood, R. D., & Co., Philadelphia.

SPECIALTIES—Rubber Covered & Lined
Goodrich, B. F., Co., The, Akron, Ohio.

SPEED REDUCERS
Philadelphia (Pa.) Gear Works.
Poole Foundry & Mch. Co., Baltimore, Md.
Twin Disc Clutch Co., Racine, Wis.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SPIKES—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

SPINDLES—Grinding
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

SPLICE BARS
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SPRING MAKING MACHINERY
Baird Mch. Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington (Conn.) Mfg. Co., The.

SPRINGS—Car
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.

SPRINGS—Extension, Compression, Torsion or Flat
Amer. Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Cook Plant of Barnes-Gibson-Raymond, Div. of Associated Spring Corp., Ann Arbor, Mich.
Cuyahoga Spring Co., The, Cleveland.
Dunbar Bros. Co., Div. of Associated Spring Corp., Bristol, Conn.
Gibson, Wm. D., Co., Div. of Associated Spring Corp., Chicago.
Hubbard, M. D., Spring Co., 745 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. of Associated Spring Corp., Corry, Pa.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SPROCKETS
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Howe Mfg. Co., The, Cleveland.
Whitney Chain & Mfg. Co., Hartford, Ct.

PRODUCTS INDEX

STAMPINGS OR DRAWINGS—Metal
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Cook Plant of Barnes-Gibson-Raymond, Div. of Associated Spring Corp., Ann Arbor, Mich.
Crosby Co., The, Buffalo, N. Y.
Dayton Rogers Mfg. Co., Minneapolis, Minn.
Dinsmore & Jager, Northampton, Mass.
Dunbar Bros. Co., Div. of Associated Spring Corp., Bristol, Conn.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Gibson, Wm. D., Co., Div. of Associated Spring Corp., Chicago.
Grammes, L. F., & Sons, Inc., Allentown, Pa.
Hubbard, M. D., Spring Co., 745 Central Ave., Pontiac, Mich.
Lansing (Mich.) Stamping Co., So. Penn. Ave.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
Parish Pressed Steel Co., Reading, Pa.
Raymond Mfg. Co., Div. of Associated Spring Corp., Corry, Pa.
Sessions, J. H., & Son, Hooker Court, Bristol, Conn.
Stanley Works, The, New Britain, Conn.
Torrington (Conn.) Company
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.
York (Pa.) Corrugating Co.

STAMPS—Steel Alphabets and Figures
Cunningham, M. E., Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., The, East Hartfrod, Ct.

STAPLES—Wire
Wickwire Brothers, Cortland, N. Y.

STEEL—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

STEEL—Alloy
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Harrisburg (Pa.) Steel Corp.
Ingersoll Steel & Disc Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Youngstown (Ohio) Sheet & Tube Co. The.

STEEL—Alloy, Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Bright Finished
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

STEEL—Carbon
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Ingersoll Steel & Disc Co., Chicago.

STEEL—Chrome Molybdenum
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.

STEEL—Chrome Nickel
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.

STEEL—Chrome Nickel Silver
Ingersoll Steel & Disc Co., Chicago.

STEEL—Cobalt
Darwin & Milner, Inc., Cleveland.

STEEL—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Moltrup Steel Products Co., Beaver Falls, Pa.
Rathbone, A. B. & J., Palmer, Mass.
Ryerson, Joseph T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Cold Rolled Strips
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Co.
Cold Metal Process Co., The, Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes, Inc., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Thomas Steel Co., The, Warren, Ohio.
Weirton (W. Va.) Steel Co.
Wetherell Bros. Co., Cambridge, 39, Mass.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Cold Rolled Strips, Electro Copper Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Electro-Galvanized
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Electro Tin Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Stainless
Cold Metal Process Co., The, Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.

STEEL—Corrosion Resisting
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.
Superior Steel Corp., Carnegie, Pa.

STEEL—Crucible
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 121 Varick St., N. Y. C.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL—Die
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia.
Jessop, Wm., & Sons, Inc., 121 Varick St., N. Y. C.
Milne, A., & Co., 745 Washington St., N. Y. C.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Drill
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Milne, A., & Co., 745 Washington St., N. Y. C.

STEEL—Electric
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—High Speed
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland (Ohio) Twist Drill Co., The.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Ingersoll Steel & Disc Co., Chicago.
Latrobe (Pa.) Electric Steel Co.
Milne, A., & Co., 745 Washington St., N. Y. C.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Hot Rolled Strips
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn., Bridgeport, Conn.
Steel & Tubes, Inc., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Weirton (W. Va.) Steel Co.

STEEL—Hot Rolled Strips, Electro Zinc Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Open Hearth
Pittsburgh (Pa.) Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Rustless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Griffin Mfg. Co., Erie, Pa.
Rustless Iron & Steel Corp., Baltimore, Md.

STEEL—Screw
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

PRODUCTS INDEX

STEEL—Special Analysis
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Harrisburg (Pa.) Steel Corp.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Spring
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace, Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Gibson, Wm. D., Co., Div. of Associated Spring Corp., Chicago.
Great Lakes Steel Corp., Detroit.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Youngstown (Ohio) Sheet & Tube Co., The.

STEEL-Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Rustless Iron & Steel Corp., Baltimore, Md.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Superior Steel Corp., Carnegie, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Stainless Clad
Ingersoll Steel & Disc Co., Chicago.

STEEL—Tool
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Darwin & Milner, Inc., Cleveland.
Disston, Henry, & Sons, Inc., Philadelphia.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Co., Chicago.
Jessop, Wm., & Sons, Inc., 121 Varick St., N. Y. C.
Midvale Co., The, Nicetown, Phila., Pa.
Milne, A., & Co., 745 Washington St., N. Y. C.
Ryerson, Jos., T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL MILL EQUIPMENT
Wellman Engineering Co., The, Cleveland

STEEL PLANTS AND ROLLING MILLS
Brassert, H. A., & Co., Chicago, Ill.

STEEL ROLLS
United Engineering & Fdry. Co., Ptgh.

STOKERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
Whiting Corp., Harvey, Ill.

STRAIGHT EDGES
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

STRAIGHTENING MACHINES—Bar & Tube
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Kane & Roach, Inc., Syracuse, N. Y.
Medart Co., The, St. Louis, Mo.

STRAIGHTENING MACHINES—Wire
Kane & Roach, Inc., Syracuse, N. Y.
Lewis Machine Co., The, Cleveland.
Shuster, F. B., Co., The, New Haven, Conn.

STRUCTURAL IRON AND STEEL WORK
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Bethlehem (Pa.) Steel Co.
Morgan Engineering Co., The, Alliance, O.

STRUCTURAL STEEL — See Angles, Beams, Channels and Tees

SUB PRESSES
U. S. Tool Co., Inc., Ampere, N. J.

SUPERHEATERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

SWAGING MACHINES
Torrington (Conn.) Company.

SWITCHES—Electric
Westinghouse Elec. & Mfg. Co., East Ptgh.

TANK LININGS
Ceilcote Co., The, Cleveland.
Nukem Prods. Corp., 68 Niagara St., Buffalo, N. Y.

TANK LININGS—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

TANKS—Alkali Cleaning
Detroit Rex Products Co., Detroit, Mich.

TANKS—Compressed Air, Gas, Oil and Water
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

TANKS—Iron and Steel
Koppers Co., Western Gas Div., Fort Wayne, Ind.

TANKS—Pickling
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Cleveland (Ohio) Quarries Co., The.
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

TANKS—Rubber Lined
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

TANKS—Welded
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

TAPPING MACHINES
Acme Machinery Co., The, Cleveland.
Baker Bros. Inc., Toledo, Ohio.
Waterbury (Conn.) Farrel Fdry. & Mch. Co.

TAPPING MACHINES—Nuts
National Machinery Co., Tiffin, Ohio.

TAPS—Collapsing
Geometric Tool Co., The, New Haven, Conn.
Landis Mach. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

TAPS AND DIES
Greenfield (Mass.) Tap & Die Corp.
Landis Mch. Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

TEES—See Angles, Beams, Channels and Tees

TERMINALS—Plain & Lock
Thompson-Bremer & Co., Chicago.

TERNE PLATES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

TESTING MACHINES—Hardness
Shore Instrument & Mfg. Co., The, Jamaica, L. I., N. Y.

TESTING MACHINES—Materials
Baldwin-Southwark Corp., Southwark Div., Phila.

THERMOMETERS
Weston Electrical Instrument Corp., Newark, N. J.

THERMOMETERS—Recording
Brown Instrument Co., The, Philadelphia.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

THREAD CUTTING TOOLS—See Dies, Taps

THREAD ROLLING MACHINES
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

THREADING MACHINES
Acme Machinery Co., The, Cleveland.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., The, New Haven, Conn.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.

THREADING MACHINES—Automatic
Landis Mch. Co., Inc., Waynesboro, Pa.

TIE PLATES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

TIN PLATE
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Wean Engineering Co., Inc., The, Warren, Ohio.

TINNING EQUIPMENT—Sheets
Wean Engineering Co., Inc., The, Warren, Ohio.

TIPS—Spot Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

TONGS—Automatic
Heppenstall Co., Pittsburgh.
Carboloy Co., Inc., 2995 E. Jefferson Ave., Detroit.

TOOL BITS
Armstrong Bros. Tool Co., Chicago.

TOOL HOLDERS
Armstrong Bros. Tool Co., Chicago.

TOOLS—Lathe
Carboloy Co., Inc., 2995 E. Jefferson Ave., Detroit.

TOOLS—Metal Cutting
Carboloy Co., Inc., 2995 E. Jefferson Ave., Detroit.
Michigan Tool Co., Detroit, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

TOOLS—Safety, Steel Stamp
Cunningham, M. E., Co., Pittsburgh, Pa.

TOOLS—Special
Continental Tool Wks. Div. Ex-Cell-O Corp., 1192 Oakman Blvd., Detroit.

PRODUCTS INDEX

TOOLS—Tungsten Carbide
Carboloy Co., Inc., 2995 E. Jefferson Ave., Detroit.

TORCHES—Brazing, Cutting and Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

TRACTORS AND TRAILERS — See Trucks, Tractors and Trailers—Industrial

TRAILERS—Industrial—See Trucks, Tractors and Trailers—Industrial

TRAMRAILS—Overhead Systems
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

TRAMWAYS—Wire Rope
Leschen, A., & Sons Rope Co., St. Louis, Mo.

TRANSMISSIONS—Hydraulic
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Vickers, Inc., 1420 Oakman Blvd., Detroit.

TRANSMISSIONS—Variable Speed
Reeves Pulley Co., Columbus, Indiana.

TRAPS—Steam
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.

TREADS—Safety
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.
Kerlow Steel Flooring Co., Jersey City, N. J.
Norton Co., Worcester, Mass.

TRUCKS—Dump (Industrial)
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Towmotor, Inc., Cleveland.

TRUCKS—Elevating (Power)
Automatic Transportation Co., 75 W. 87th St., Chicago.
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, Cleveland.
Towmotor, Inc., Cleveland.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS—Lift (Hand & Foot)
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS—Scoop (Industrial)
Towmotor, Inc., Cleveland.

TRUCKS, TRACTORS AND TRAILERS—Industrial
Atlas Car & Mfg. Co., The, Cleveland.
Automatic Transportation Co., 75 W. 87th St., Chicago.
Baker-Raulang Co., The, 2175 W. 25 St., Cleveland.
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, Cleveland.
Towmotor, Inc., Cleveland.
Yale & Towne Mfg. Co., The, Phila., Div., Phila., Pa.

TUBE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., Ptgh.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

TUBE MILL MACHINERY—Welded
McKay Machine Co., The, Youngstown, Ohio.

TUBES—Boiler
Bissett Steel Co., The, Cleveland.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Steel & Tubes, Inc., Cleveland.

TUBES—Copper Alloy
American Brass Co., The, Waterbury, Conn.

TUBES—High Carbon
Steel & Tubes, Inc., Cleveland.

TUBES—Nickel Silver
American Brass Co., The, Waterbury, Conn.

TUBES—Stainless Steel
Bissett Steel Co., The, Cleveland.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ryerson, Jos., T., & Son, Inc., Chicago.
Steel & Tubes, Inc., Cleveland.

TUBING—Aluminum Seamless
Aluminum Co. of America, Pittsburgh.

TUBING—Flexible Metallic
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

TUBING—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

TUBING—Nichrome
Steel & Tubes, Inc., Cleveland..

TUBING—Open Seam
Steel & Tubes, Inc., Cleveland.

TUBING—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.

TUBING—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.

TUBING—Seamless Steel
Bissett Steel Co., The, Cleveland.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ohio Seamless Tube Co., The, Shelby, Ohio.
Pittsburgh (Pa.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Steel & Tubes, Inc., Cleveland.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Youngstown (Ohio) Sheet & Tube Co., The.

TUBING—Square and Rectangular
Steel & Tubes, Inc., Cleveland.

TUBING—Stainless Steel
Steel & Tubes, Inc., Cleveland.

TUBING—Tinned Brass or Copper
Bundy Tubing Co., Detroit, Mich.

TUBING—Tinned-Steel
Bundy Tubing Co., Detroit, Mich.

TUBING—Tool Steel
Bissett Steel Co., The, Cleveland.

TUBING—Welded Steel
American Welding & Mfg. Co., Warren Ohio.
Bundy Tubing Co., Detroit, Mich.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ohio Seamless Tube Co., The, Shelby, Ohio.
Steel & Tubes, Inc., Cleveland.
Youngstown (Ohio) Sheet & Tube Co., The.

TUBULAR PRODUCTS
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Steel & Tubes, Inc., Cleveland.

TUMBLING BARRELS—See Barrels—Tumbling

TUNGSTEN METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

TUNGSTEN CARBIDE
Carboloy Co., Inc., 2995 E. Jefferson Ave., Detroit.
Firth-Sterling Steel Co., McKeesport, Pa.

TURBINE-GENERATORS—Steam
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURNTABLES
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

TURNTABLES—Industrial
Canton Fdry. & Mch. Co., Cleveland.

TWIST DRILLS
Cleveland (Ohio) Twist Drill Co., The.
Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

TYPE—Steel
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

UNCOILERS—Processing
McKay Machine Co., The, Youngstown, Ohio.

UNIONS
Crane Co., Chicago.

UNIT HEATERS—Electric
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.

VALVES—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
National Lead Co., 111 Bdway., N. Y. C.

VALVES—Air
Koppers Co., Western Gas Div., Fort Wayne, Ind.

VALVES—Air Blast for Presses
Littell, F. J., Mch. Co., Chicago.

VALVES—Air & Hydraulic Control
Brown Instrument Co., The, Philadelphia.
Hannifin Mfg. Co., Chicago.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.
Tomkins-Johnson Co., The, Jackson, Mich.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

VALVES—Butterfly
R-S Products Corporation, Phila., Pa.

VALVES—Gas, Water and Steam
Brown Instrument Co., The, Philadelphia.
Crane Co., Chicago.
Jarecki Mfg. Co., Erie, Pa.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Wood, R. D., & Co., Philadelphia.

VALVES—Hydraulic
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Crane Co., Chicago.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Vickers, Inc., 1420 Oakman Blvd., Detroit.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia.

VALVES—Proportioning
Brown Instrument Co., The, Philadelphia.

VALVES—Pump, Rubber
Garlock Packing Co., The, Palmyra, N. Y.

VALVES—Solenoid
R-S Products Corporation, Phila., Pa.

VANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

VISES
Cincinnati (Ohio) Milling Mch. Co., The.
Jarecki Mfg. Co., Erie, Pa.

PRODUCTS INDEX

WASHERS—Bevel Steel
Nicetown Plate Washer Co., Inc., Philadelphia.

WASHERS—Iron or Steel
Nicetown Plate Washer Co., Inc., Philadelphia.
Sessions, J. H., & Son, Hooker Court, Bristol, Conn.

WASHERS—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

WASHERS—Lock
American Nut & Bolt Fastener Co., Pittsburgh.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, Ohio.
Eaton Mfg. Co., Massilion, Ohio.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., The, Newark, N. J.
Spring Washer Industry, 616 Wrigley Bldg., Chicago, Ill.
Thompson-Bremer & Co., Chicago.
Washburn Co., The, Worcester, Mass.

WASHERS—Spring
American Nut & Bolt Fastener Co., Pittsburgh.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, Ohio.
Eaton Mfg. Co., Massilion, Ohio.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., The, Newark, N. J.
Spring Washer Industry, 616 Wrigley Bldg., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WELDER CONTROL—For Spot, Butt & Projection Welding Machines
Electric Controller & Mfg. Co., The, Cleveland.

WELDING—Copper Hydrogen Electric
Bundy Tubing Co., Detroit, Mich.

WELDING—Electric
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Ptgh.

WELDING—Thermit
Metal & Thermit Corp., 120 Broadway, N. Y. C.

WELDING CONTACTORS
Clark Controller Co., The, Cleveland.

WELDING AND CUTTING MACHINES AND EQUIPMENT—Oxy-Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

WELDING FIXTURES
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

WELDING MACHINES—Butt
Eisler Engineering Co., 738-750 South 13th St., Newark, N. J.
Swift Electric Welder Co., Detroit.

WELDING MACHINES—Electric Arc
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Ptgh.

WELDING MACHINES—Electric Arc, Second-Hand. (See Clearing House Section)

WELDING MACHINES—Flash
Swift Electric Welder Co., Detroit.

WELDING MACHINES—Press
Swift Electric Welder Co., Detroit.

WELDING MACHINES—Spot
Eisler Engineering Co., 738-750 South 13th St., Newark, N. J.
Swift Electric Welder Co., Detroit.

WHEELS—Rolled Steel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Standard Steel Wks. Co., Phila., Pa.

WHEELS—Seam Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh.

WIRE—Barb
Pittsburgh (Pa.) Steel Co.

WIRE—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.

WIRE—Flat, Round, Square or Special Shapes
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE—Insulated
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
General Electric Co., Schenectady, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Mattress
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Netting
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Cortland, N. Y.

WIRE—Piano and Music
Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

WIRE—Special Drawn Shapes
Rathbone, A. B. & J., Palmer, Mass.

WIRE—Spring
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Spring (Music)
Webb Wire Works, New Brunswick, N. J.

WIRE—Stainless Steel
Rustless Iron & Steel Corp., Baltimore, Md.
Webb Wire Works, New Brunswick, N. J.

WIRE—Steel
Bethlehem (Pa.) Steel Co.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Wickwire Brothers, Cortland, N. Y.

WIRE—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Pittsburgh (Pa.) Steel Co.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH
Buffalo (N. Y.) Wire Wks. Co., Inc.
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE DRAWING MACHINERY—See Wire Mill Mchry. & Equip.

WIRE FORMING MACHINERY
Baird Mch. Co., The, Bridgeport, Conn.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
U. S. Tool Co., Inc., Ampere, N. J.

WIRE MILL MACHINERY AND EQUIPMENT
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington (Conn.) Mfg. Co., The.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

WIRE NAIL MACHINERY
National Machinery Co., Tiffin, Ohio.

WIRE PRODUCTS
American Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Co.
Buffalo (N. Y.) Wire Wks. Co., Inc.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 745 Central Ave., Pontiac, Mich.
Pittsburgh (Pa.) Steel Co.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE ROPE
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Co.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Leschen, A., & Sons Rope Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE ROPE FITTINGS
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY—Automatic
Lewis Machine Co., The, Cleveland.
Shuster, F. B., Co., The, New Haven, Ct.

WRENCHES
Armstrong Bros. Tool Co., Chicago.
Billings & Spencer Co., Hartford, Conn.

WRENCHES—Pipe
Greenfield (Mass.) Tap & Die Corp.

WRENCHES—Pneumatic
Ingersoll-Rand Co., 11 Broadway, N. Y. C.

ZINC—SLAB (Spelter)
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ZINC—Strip
Platt Bros. & Co., The, Waterbury, Conn.

ZIRCONIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

THE CLEARING HOUSE

CONSIDER GOOD USED EQUIPMENT FIRST

BENDING ROLLS—DROP END HOUSING
30' Southwark, Motor Drive. Capacity 1½"
20' Covington. Motor Drive. Capacity 1"
13' Niles Motor Drive. Capacity ⅝"

BORING MILL—HORIZONTAL
8" bar Barrett Special Horizontal Cylinder Boring Machine, Belted Motor Drive. Facing arms have capacity to face diameters 11" to 53"; complete with boring head and tools

BORING MILLS—VERTICAL
42" Bullard Rapid Production, Arr. for M.D. 1 Swivel and 1 Turret Head on Rail
60" Betts, Motor Driven. Two Swivel Heads on Cross Rail

DRAW BENCHES
24' Chain Draw Bench, Motor Drive. Equipped with Single Bull Block
35' Chain Draw Bench, Equipped with Aetna Pusher & Hydraulic equipment for operation
100,000 lb. Aetna No. 3, Arr. for Motor Drive. Equipped with Aetna Pusher. Capacity 4½" Round Bars
200,000 lb. Brightman, Motor Drive. 40' Draw. Capacity 8" dia. maximum

FORGING MACHINES
1" to 5" Acme, Ajax, National All Steel Frame. Some late models

GRINDERS—SURFACE
36" Diamond Heavy Duty, Arr. for M.D. Capacity to grind work 24"x84"
25" Heald Rotary, Motor Driven. 16" Magnetic Chuck. Latest Model

HAMMERS—BOARD DROP
1600 to 5000 lb. Chambersburg, Erie, Billings & Spencer

HAMMERS—STEAM DROP
3000 to 12,000 lb. Chambersburg and Erie

HAMMERS—STEAM FORGING
2000 lb. to 8000 lb. Chambersburg, Sellers, Niles-Bement-Pond Single & Double Frame

HAMMER—NAZEL
No. 4-B Nazel Hammer, Motor Driven. Capacity 5" square

LATHE—CAR WHEEL
42" Sellers Extra High Power, Motor Drive

LEVELLERS—ROLLER
30" Leveller 9 Rolls 3½" dia., Arr. for M.D.
40" Hilles & Jones 8 Roll, M.D. Rolls 4¼" dia. Capacity ¼" Plate
38" Bliss 9 Rolls 2¾" dia. Motor Driven
54" McKay Type B 17 Rolls 4⅛" dia. M.D.

PARTIAL LIST
OVERHEAD ELECTRIC TRAVELING CRANES

3 ton Shepard,	33'3"	span, 440/3/60 A.C.
5 ton Niles,	48'⅞"	span, 220 Volt D.C.
5 ton Whiting,	62'8"	span, 220 Volt D.C. With 624' Runway
5 ton Maris,	35'	span, 220/3/60 A.C. 100' Runway
7½ ton P. & H.,	39'6"	span, 220 Volt D.C.
10 ton Northern,	66'6"	span, 440/3/60 A.C.
10 ton Niles,	37'	span, 440/3/60 A.C. 240' Runway
10 ton Shaw,	48'6"	span, 220 Volt D.C. with 160' Runway
15 ton Shepard,	50'	span, 220 Volt D.C. with Runway
20 ton Shaw,	44'7"	span, 220/3/60 A.C.
20 ton Shaw,	55'	span, 110 Volt D.C. with 5 ton auxiliary hoist
20 ton Morgan,	62'	span, 220 Volt D.C. with 10 ton auxiliary hoist
25 ton Niles,	55'	span, 220 Volt D.C.

MILLING MACHINE—PLANER TYPE
48"x48"x14' N-R-P Extra Heavy Duty Type, Adjustable Rail. 4 Milling Heads, 1 Aux. Head for slab milling & boring

PLANER
72"x72"x16' Niles, Motor Driven. Four Head

PLANERS—OPEN SIDE
36"x36"x18' Detrick & Harvey, Belt Drive
60"x60"x26' Detrick & Harvey, Three Head. Motor Driven including 30 HP and 5 HP AC Motors. Power Feed, Air Cushion. Table Return

PRESSES—TOGGLE DRAWING

No. 2719 Hamilton,	27" Between Uprights
No. 15A Bliss,	40" Between Uprights
No. 408 Bliss,	60" Between Uprights
No. 1018 Bliss,	60" Between Uprights
No. 408B Bliss,	84" Between Uprights
No. 412 Bliss,	86" Between Uprights

PRESS—STRAIGHT SIDE
No. 78½ Bliss 36" Between Uprights, 12" Stroke

PUNCH & SHEAR COMBINATION
36" Throat Cleveland Style EF Single End. Motor Drive. Capacity Punch 1¼" thru 1"

ROLLING MILLS
NUMEROUS HOT AND COLD, TWO AND THREE HIGH MILLS. COMPLETE WITH DRIVES. VARIOUS SIZES AND CAPACITIES

ROLLS—PLATE STRAIGHTENING
62" Niles 7-Roll, Arr. for Belt or Motor Drive. Rolls 12" Diameter
50" Niles, 7-Roll, Motor Dr. Rolls 8" Dia.

SAWS
48" Ryerson Special Duty Friction Saw, Motor Drive. Capacity 20" I-beams
52" Ryerson, Motor Driven. Hydraulic Feed. Capacity 24"-115 lb. I-beams

SHEARS—BAR
No. 10 Buffalo Armor Plate, Belt or Motor Drive. Capacity 3⅞" Round, 3½" Square, 8x8x⅝" Angles, Flats 8x1¼"
No. 4 Hilles & Jones Guillotine Bar Shear, Arr. for M.D. Capacity Rounds 4", Squares 3½", Angles 6x6x⅝"

SHEARS—SQUARING
12' Stamco, Motor Driven. Complete with Hold-down and gages. Capacity No. 10 Ga.
156" Streine, Arr. for M.D. Capacity 3/16"
156" Hyde Park, Arr. for M.D. Capacity ¼"

SHEAR—ROTARY
Stanley Model B Unishear, Motor Drive. 36" Throat. Capacity ¼" and lighter

SLITTERS—GANG
42" Bliss No. 325C, Motor Driven. Capacity 8 cuts No. 20 gage steel
30" Lamb & Nash, Silent Chain Drive. Capacity .040 Gage

STRAIGHTENERS
No. 3 SUTTON TWO-WAY Straightener. Capacity 1"x1" Square or corresponding duty in other shapes
No. 0 Sutton Round Straightening Machine. Capacity Bars 5/16" to ⅞". Tubes ⅜" to 1⅜"
No. 305 Torrington 12-Roll, Arr. for M.D. Capacity ⅜" to 1⅝" Tubes and Rods
3/16", ⅜", ¼", ½", ⅝" Shuster Rotary Straightener and Cut-off Machines with Cut-off

TESTING MACHINES
50,000, 100,000, 300,000, 600,000 lb. Olsen & Riehle Universal Belt & Motor Dr.
400,000, 600,000 lb. Olsen Chain Testing Machines
No. 2½A Rockwell Hardness Tester

WIRE DRAWING MACHINES
No. 2 Waterbury Farrel 10-Die, Arr. for M.D. Capacity to draw No. 12 down to No. 24 gage
Morgan Double Drum, Arr. for M.D. Capacity ⅝" dia. Wire

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MACHINERY, EQUIPMENT & APPURTENANCES

At plant of the

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

26 St. & Allegheny Valley RR.,
PITTSBURGH, PA.

SINGLE LOTS — ABSOLUTE — NO CONFIRMATION NECESSARY

Wednesday and Thursday APRIL 12, 13, 1939

***Sale Includes* (882 items)**

TOOL ROOM & MACHINE SHOP: 28 Screw Cutting Engine Lathes up to 42" swing by 32' bed; Detrick & Harvey 84"x84"x18' Openside Planer, with aux. housing 4 heads; 15 Drill Presses, Radial, Floor & Multiple Spindle; 7 Turret Lathes; 8 Fox Lathes; 9 Grinders; 7 Boring Mills, Vertical & Horizontal; Shaper; Planer; Keyseater; 3 Milling Machines; 3 Tappers.

PIPE SHOP: 10 Pipe Machines up to 12" capacity; Flange Finishing Lathes up to 38" x 29'; Van Stone Joint Machines; 21' Pipe Heating Furnaces; Bending Tables; Capstans; Pipe Vises; Wrenches; Tools; etc.

FOUNDRY & BRASS SHOP: 10 Molding Machines; Sand Blast Room; Blower; Buckets; Ladles; Ovens; Shakers; Cupolas; Core Ovens; FLASKS; Tumbling Barrels; etc.

WOODWORKING EQUIPMENT: Band Saws; Saw Tables; Jointer; Planers; Sanders; Turning Lathes; Vises; Clamps, etc.

ELECTRICAL EQUIPMENT: 200KW Motor Generator; 220 KW Engine Generator; Motors up to 50 H.P.

MISCELLANEOUS: Electric Lift Truck; Chain Blocks; Angle Plates; Wrenches; Chucks; Belting; Lay Out Tables; Springless Dial Scales, etc.

Catalogs FREE **Inspection daily to day of sale** **Send for copy at once**

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Manager

***MAIN OFFICE*: 2 ORANGE STREET, NEWARK, N. J.**

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"GREEN LIST"

Boring Machines, 5" Bar N-B-P Floor Type
No. 3 Hamilton, Floor Type, 4½" bar
No. 3 Barnes Double End, 3⅛" bar
No. 2 Rochester, 3" bar
No. 3A Universal, 3" bar
No. 1 Cleveland, 2½" bar

Boring Mills, No. 1-A Pratt & Whitney Jig Borer
24", 36" Bullard "New Era"
30", 52" King
42", 48", 54", 60" Colburn
62", 72" King

Drills, 1, 2, 3, 4, 6 spdl. Leland-Gifford
4 Spdl. Demco, Power Feed
1, 2, 3, 4, 6, 8 spdl. Henry & Wright
No. 2 Colburn 1, 2, 3 & 4 spindle
No. 4 Colburn, 2 spdl.
No. 2, No. 3 Defiance, 1 spindle
No. D-4 Colburn Heavy Duty
No. 314, No. 416 Baker
No. 2 Western Multiple
No. 14 Natco Multiple
No. 1, No. 3, No. 4 Baush Multiple

Radials, 4' Fosdick, "Speedy Sensitive"
3½' Mueller Plain, Motor Drive
4' Western, Plain
5' Cinn.-Bickford Plain
5' American Full Universal

Gear Cutters, Nos. 2, 3, 12 Barber-Colman Hobber
No. ½, No. 1 Pfauter Hobber, Motor Drive
No. 3—26" Brown & Sharpe
No. 4—36", No. 4—48" Brown & Sharpe
No. 2, No. 3 Pfauter Hobber
No. 2—60" Goss Hobber
Nos. 6, 61, 615, 62, 624, 645 Fellows, M.D.
No. 18H Gould & Eberhardt Hobber
No. 16HS Gould & Eberhardt Hobber

Grinders, 8"x18", 8"x36" Cincinnati, saddle type
20"x168" Landis, plain, Motor Drive
26"x96" Landis, plain
No. 2 Brown & Sharpe Universal
No. 4-A—16"x66" Landis Universal
No. 70 Heald, Internal
No. 10 Blanchard Vertical Surface
No. 16-A Blanchard Auto. Vertical Surface

Motor Driven Norton Grinders

6"x32"	10"x50"	14"x72"	
10"x18"	10"x72"	14"x96"	
10"x24"	10"-15" GAP x 72"	16"x50"	
10"-15" GAP x 24"	14"x36"	16"x72"	
10"x36"	14"x50"	18"x96"	
20"x96"	22"x120"		

Lathes, 14"x8' Lodge & Shipley Grd. Hd.
14"x8' LeBlond Geared Head, M.D.
16"x6', 12' Lodge & Shipley Geared Head
17"x8' LeBlond Hvy. Duty Grd. Hd., M.D.
18"x8' Lodge & Shipley Grd. Head, M.D.
19"x8' LeBlond Hvy. Duty Grd. Hd., M.D.
20"x14' L. & S. Sel. Geared Head
24"x14', 16' L. & S. Sel. Grd. Hd.
24"x14', 16' American Geared Head
26"x10' LeBlond Crankshaft
26"x30' Boye & Emmes, Taper Attachment
27"x12' American Geared Head, M.D.
30"x11', 15' American Geared Head
30"x16' American, Taper Attachment
36"x12' Lodge & Shipley Selective Triple Geared Head
36"x14', 20' L. & S. Sel. Geared Head
66"x21' Putnam, triple geared, Motor Drive

Millers, No. 0Y Brown & Sharpe Plain
No. 2-B Milwaukee Plain
No. 3 Cincinnati, high power, plain
No. 3-H LeBlond Plain
No. 3-B Milwaukee Plain
No. 3-B, No. 4-B Heavy Brown & Sharpe, pl.
No. 2-B, No. 3-B Milwaukee Universal
No. 4-A Brown & Sharpe Universal
No. 3-B Milwaukee Vertical
No. 3, No. 4 Cincinnati Vertical
No. 5-B, No. 6 Becker Vertical
6"x14", 6"x48" Pratt & Whitney Thread
No. 4, No. 8 Lees-Bradner Thread
18" & 24" Cincinnati Auto. Duplex
24" Cincinnati Auto. Simplex
No. 5—48" Cincinnati Pl. Hydromatic M.D.
24"x24"x12' Ingersoll, Adjustable Rail
38"x44"x20' Ingersoll Slab

Planers, 24"x24"x12' Gray
30"x30"x8' American
30"x30"x14' Gray, Rev. Motor Drive
30"x30"x18' Cincinnati
36"x36"x8', 12', 18' Cincinnati
36"x36"x12' Gray Maximum Service, M.D.
36"x36"x14'—24' Cleveland Open Side, M.D.
42"x42"x30' Niles Bement Pond, rev. M.D.
48"x48"x10' Detrick & Harvey, Open Side
60"x48"x20' Hamilton
72"x60"x16' American
72"x72"x16' Cincinnati, Motor Drive

Turret Lathes, No. 1-B Foster Universal
No. 1-A, No. 2-A W. & S., Motor Drive
No. 3-A Warner & Swasey Universal
No. 4-A Warner & Swasey, Motor Drive
26" Libby-International, 7½" H.S.

Miscellaneous, 2" Landis Pipe Machine
No. 211 Barnes B. B. Honing Machine
15"—18" Dill Slotter
No. 3 Barber-Colman Hob Sharpener

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K. & T. #2B PL. MILLER; MOTOR-IN-BASE
CINCINNATI #3 PL. MILLER; RECTANGULAR
B. & S. NOS. 3B, 4B, 5B PL. MILLERS; MOTOR DRIVE; POWER RAPID TRAVERSE
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CLEVELAND 48"x48"x16' O. S. PLANER
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1	250	Whse.	SA	250/750
1	150	Cr. Wh.	151H	400/1200
3	125	G.E.	DMC	480/1200
14	120	G.E.	DMC	300/900
2	100	Rel.	T	400/1200
6	75	Cr. Wh.	H	350/900
3	60	El. Dy.	S	525/1050
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1— 300 KW G. E. synchronous, 600 V. DC
1— 300 KW G. E. 3 unit, 125/250 V. DC
1— 240 KW G. E. synchronous, 275 V. DC
1— 150 KW G. E. synchronous, 275 V. DC
1— 150 KW G. E. synchronous, 600 V. DC
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